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WORLD SWORDFISH FISHERIES

Volume IV

Latin America

Part B. Caribbean

Section 3. Dominica to Martinique

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service

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WORLD SWORDFISH FISHERIES

An Analysis of Swordfish Fisheries, Market Trends, and Trade Patterns
Past-Present-Future

Volume IV.
Latin America

Part B. Caribbean

Section 3. Dominica to Martinique

Prepared by
The Office of Science and Technology

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PENNSYLVANIA STATE UNIVERSITY
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Dominican Republic: **Adele Crispoldi** with the FAO Department of Fisheries provided information on fishery statistics. **Felicita Heredia L.**, Directora de Conservación Costera Marina, provided current information on the Dominican fleet and fishing operations. **Gale Lawrence** provided fleet observations fiom whale watching trips. **Craig Lilyestrom** from the Departamento de Recursos Naturales y Ambiente on Puerto Rico provided information on fishery relations. Photographer **Amos Nachoum** provided information on his boat observations. **Enrique Pugibet**, Director del Acuario Nacional, provided some current information on Dominican fisheries. **Jill Stevenson** with NMFS provided information on U.S. Caribbean operations.

Grenada: **Freddy Arocha** with the Universidad de Oriente provided information from his research with Venezuelan fishermen. **Alan Brown** with Seafood Ltd. provided information on seafood marketing and longline operations. **Karen Eckert** with WIDECAST provided information on sea turtles. **Mark Farber** with NMFS provided information on his billfish work as well as some wonderful photographs. **James Finlay,** Chief Fisheries Officer, provided information on the fishing industry. **Brenda Fletcher** with Caribbean Seafood provided information on the company's operations and work with longliners. **Jason Fletcher**, Chairman of Grenada Marine, provided information on his new boat facility and a wide range of issues concerning Grenadian fisheries. **Stephen Fletcher** with Caribbean Seafood provided a tour of the company's facilities. **Christopher Jeffrey**, Sea Grant Fellow, provided the authors information concerning many aspects of the Grenadian fishing industry. **Neil Frank**, Captain of the *Jani 2*, provided interesting information about fishing operations. **Ian Harford** with Bezo Charters provided information on recreational fisheries and nice photographs. **John Hoey** with NMFS provided useful information on bycatch trends. **James Ince** with Seafood Ltd. provided information about his company's operations. **Robert Miller**, IGFA representative, organized a briefing on recreational fisheries during the authors visit. **Howard Otway** provided information on recreational fisheries. **Paul Phillips** with the Fisheries Division provided important information on the fisheries industry of the island. He described artisanal and commercial fishery operations in detail. He provided statistical fisheries data, and he helped the authors with several contacts to arrange other interviews. **Eric Prince** with NMFS provided information on his billfish work. **Rennie Justin** provided extensive information on the Grenadian fishing industry. **Claire Shirley** with Ocean Spirits provided information on efforts to save turtles. **Suzane Sing-Renton** with CFRAMP provided information about her work with Caribbean fisheries. **Raymond Steele** with the Artisanal Fisheries Development Project provided information on his promotional efforts. **Megil Vincent**, Manager of Grenada Commercial Fisheries Ltd. briefed the author on his company's operations.

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PERSONAL OBSERVATIONS

Hurricane David "... devastated the Dominican fishing industry. It wiped away about 90 percent of the fishing fleet, destroyed and made impossible to use temporarily 50 percent of all fish landing sites. Even now (1989), some sites are still recovering ..." -- Nigel Lawrence, Fisheries Development Advisor, July 1989.

"We have a special section of the Bank making loans to the fishing industry. Our two loans for commercial longliners, however, were disasters. The fishermen stopped payment and absconded with the vessels. I think that we will be very reluctant to make any further loans for commercial fisheries. Perhaps our waters just can't support a commercial operation." -- Patrick Delauney, Fisheries Manager, Agricultural Industrial Development Bank of Dominica, February 24, 2000

"I have had mixed success with training small-scale artisanal fishermen on Dominica, Martinique, and St. Lucia in the use of longlines. One of the big problems is that the fishermen don't like to stay out at sea over night. To get good results, however, the lines need to be set at night or early in the morning before dawn. Tuna off Dominica appear to seasonally occur at different depths. This is why fishermen on Dominica experienced an off season. One of the results of the training programs I have conducted is to show them how to catch tuna all year round with simple longlines." -- Hon Juey Pso, Taiwan Fisherman, Tuna and Longlining Training Project, February 22, 2000

"We are the most successful cooperative on Dominica. Our fishermen use a variety of gear and we have experimented with longlines. There are seven of us attempting small-scale longlining in Dominica. We were having good results with tuna and other species before Hurricane Lenny swamped us in November 1999. We are trying to resume operations, but the cost of buying new gear and motors and replacing one of the boats has been a major obstacle." -- Oliver Jerome, Treasurer, Newtown Fishermen's Cooperative, February 25, 2000

"The coops do not seem to work very well, at least not on Dominica. Fishermen don't seem to like attending meetings to discuss their business. This is a very serious problem since it means that in many cases people other than the fishermen are leading the industry." -- Riviere Sebastian, Fisheries Officer, September 24, 2000

"Dominican fishermen use a variety of lines and nets which they deploy from mostly small boats. There is currently no longlining here in the Dominican Republic. -- Felicita Herredia, Directora de Consevación Costera Marina, September 7, 2001

"Swordfish is virtually unknown here in the Dominican Republic. There is, however, a strong demand for the tuna and mackerel taken by our local fishermen." -- Enrique Pugibet, Director of the National Aquarium, February 19, 2001

"Longlining is the most dynamic sector of our fishing industry here on Grenada. The fisherman are positive about longlining. Several have entered the fishery in recent years and we have quite a substantial fleet. The Government has been providing incentives like duty free gear and reimbursement for fuel." -- Paul Phillips, Acting Chief of the Fisheries Division, August 3, 1999

"Actually the Cubans played a very important role in the development of our longline fishery. Their ferro-cement boats did not prove very effective, but the simple longlining methods they introduced were at the level that was helpful for our small-scale fishermen in the early 1980s. Now of course the longline fishermen use American-style monofilament gear." -- Justin Rennie, Fisheries Division, September 27, 1999

"There are no large commercial longliners in the Grenada fleet. The fishermen are, however, gradually increasing the size of the vessels as well as the length of line and numbers of hooks deployed." -- Christopher Jefferey, Sea Grant Fellow, June 4, 1999.

"Our longline fishermen here on Grenada have been primarily interested in tuna and billfish more than swordfish. Many do not want to fish at night and swordfish require evening sets. Also some fishermen complain that the large, stronger swordfish can play havoc with their gear." -- Jason Fletcher, Grenada Marine, September 28, 1999

"There are a lot of complications in marketing swordfish, especially export sales. We lost a lot of money on shipments detained in the United States. We have since marketed the swordfish catch locally." -- Megil Vincent, Grenada Commercial Fisheries, September 27, 1999

"Japanese advisers have been working with the fishermen, encouraging them to make longer trips and set in deeper water. This is probably one reason that they have reported larger swordfish catches in 2000." -- Alan Brown, Seafood Ltd., February 5, 2001

"Grenada is a wonderful place for sportfishing. Good results including sailfish are possible just a few minutes outside St. George's harbor in calm Caribbean waters. We target quite a few different species. We have not gone after swordfish yet, but there is some interest in it. The principal tournament is the Spice Island Billfish Tournament. Normally more than 40 boats participate and take 150 or more billfish each year." -- Howard Otway, Reel Affair, September 27, 1999

"Upon learning about tag and release fishing, one Grenadian official dismissed recreational fishing as "a few white boys with money who want to let fish go rather than feed hungry people". -- Howard Batiste. Grenadian Minister of Agriculture, Lands, Food, Forestry, and Fisheries, 1999

"Hey man, why are you taking pictures of my boat. This is private property. I don't want my ... boat photographed." -- Grenadian fisherman

"No one is longlining for oceanic pelagics in Jamaica at this time. I recommended in 1996 a small-scale longline project for Jamaica's north coast. I still believe there is some potential for a small fishery there." -- Robin Mahon, Fisheries and Environmental Consulting, September 7, 2000

"The large pelagics are taken mainly by trolling lines behind canoes. There is a season of increased catches from about October to March every year. Though these are commercially valuable species, there is no commercial fishery for larger pelagics in Jamaica as these have always yielded small, highly seasonal catches." -- K. Aiken (UWI Professor) and G.A. Kong (Director of Fisheries), January 2000

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DOMINICA

Dominica has one of the smallest fishing industries and Exclusive Economic Zones in the Caribbean. Given Dominica's limited agricultural potential, some observers believe that the marine resources should be more fully utilized. The island's fishermen conduct primarily artisanal operations. There are also limited commercial operations underway. Several commercial longliners were deployed in the late 1990s. Some experienced disappointing results and the owners have since deployed their vessels elsewhere. Other owners have defaulted on their vessel loans. Two commercial longliners are still active. Artisanal fishermen conduct small-scale longlining, but many of these operations were interrupted when the vessels and gear were damaged or destroyed by Hurricane Lenny in 1999. The Hurricane also badly damaged the country's limited port infrastructure and the new Japanese fisheries complex in Rosseau. There is no reported swordfish catch, although longline fishermen are known to catch small quantities. Fishery officials report some success with fish aggregating devices. Some fishermen are interested in longlining, but the cost of initiating a new fishery has so far made it difficult for the fishermen to do so. Even so, five fishermen in 2000 applied for permits to acquire longliners. In addition, the Japanese have committed to repairing hurricane-damaged facilities at Rosseau and building two new complexes at other locations. The catch is marketed domestically on the island, but imports are needed to satisfy demand. The Rosseau fisheries and virtually the entire fisheries helped to reduce imports, but after the Hurricane damaged the facility, Dominica has had to again rely heavily on foreign suppliers. Dominica participates in the common surveillance activities of the Organization of Eastern Caribbean States, but participation is complicated because the island is separated from the other OECS states by the two neighboring French islands, Guadeloupe and Martinique.

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Figure 1.--Map of Dominica.

I. Overview

A. Background

Dominica is one of the Windward Islands in the Lesser Antilles. It is located between the French islands of Guadeloupe and Martinique. Like many of its neighbors, this now tranquil Caribbean island was the object of a protracted struggle among native Americans and competing colonial powers. The island's fertile soil, despite its small size, made it a potential valuable colonial possession as a producer of sugar. The potential profits attracted settlers and colonizers and made Dominica the prize in a serious of often bloody European military engagements.

The island was named by Columbus in November 1493 because he first viewed in on Sunday, "domingo" in Spanish. At the time the Caribbean Indians from South America were in the process of driving the more peaceful indigenous Arawaks from one Caribbean island after another. The English in 1627 claimed Dominica without settling, but by 1632 it had become a *de facto* French colony and remained so until 1759 when the English recaptured it. The English and French agreed in 1660 to leave the Dominica to the Caribs, but in fact French settlers continued to settle the island, bringing Africans slaves with them. Dominica changed hands between the two European powers, passing back to France (1778) and again to England (1783). The French during the French Revolutionary and Napoleonic Wars attempted to invade in 1795 and 1805 before eventually withdrawing and finally leaving Britain in possession of the much disputed island.

Dominica in 1833 was linked to Antigua and the other Leeward Islands under a Governor-General at Antigua, but subsequently became part of the Federation of the Leeward Islands Colony (1871-1939) before becoming a unit of the Windward Islands group (1940-60). Dominica joined the short-lived West Indies Federation at its foundation in 1958 and remained a member until differences among larger members led to its dissolution in 1962. Dominica then became an associated State of the United Kingdom before achieving full independence as the Commonwealth of Dominica in 1978. The legislature is the House of Assembly which is made up of mostly elected members.

B. Fishing industry

The Dominican fishing industry is a small, mostly artisanal operation. Fishermen have traditionally used keel boats ("dories") and dugout canoes, although the dugouts are no longer as dominate as they once were. The existence of relatively deep water close to the coast, especially off the western coast, and lack of extensive coral reefs mean that Dominica has very limited demersal resources. The island's fishery is thus based primarily on pelagic species because Dominica is located astride the migratory path for important pelagic species such as tunas, king mackerel, dorado, and flyingfish. Other species are seasonally plentiful. The principal species caught is flying fish.[1]

Fisheries makes only a small contribution to the national economy, less than 2 percent of domestic production.[2] The fisheries catch in the early 1980s was over 1,500 metric tons (t), but declined precipitously in 1982-83. Catches through 1996 were less than 1,000 t annually. Catches have increased in the 1990s, and are approaching levels reported in the early 1980s (appendix B1). Dominican officials are not sure why catches declined in the late 1980s. The largest catch during the 1990s has been the 1,200 t reported in 1998. The 1999 catch is believed to have shown little change.

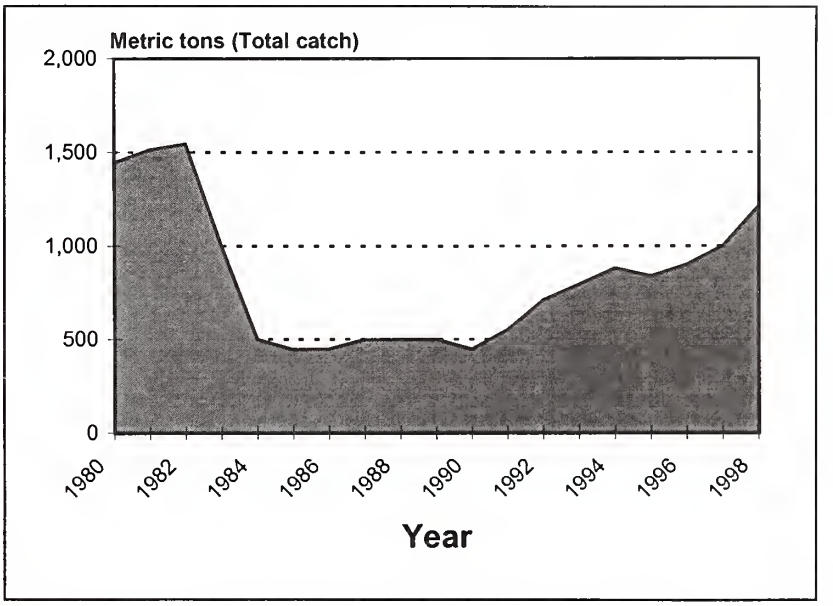

Figure 2.--Dominican fisherman during the mid-1980's reported a drastic decline in their fisheries catch, however, catches increased during the 1990's.

Photo 1.--Some Dominican fishermen have been experimenting with longlines in recent years, however, the results have been mixed. Riviere Sebastian

port has been redeveloped and a new fish market built, both with assistance from Japan--which provided $17 million for the projects. Tragically the new facilities were badly damaged in 1999 by Hurricane Lenny. About $7 million will be needed for repairs.

Dominican officials are concerned about the fishing industry's failure to attract educated young people. Few younger Dominicans seem to see a future in fishing. Some of the individuals that do enter the industry are poorly educated with few alternative job prospects. A Dominican fisheries officer prepared his M.Sc. dissertation on this subject. He found an unusually large number of the country's fishermen were over 50 years of age. This may be a factor in the industry's slowness to adopt more modern gear and methods.[8]

Some observers have questioned why the fishing industry on neighboring islands like Guadeloupe and Martinique appears to be healthier and more dynamic than that of Dominica.[3] An assessment of the Dominican fishery prepared in 1985 indicated that Dominicans have made little organized effort to assess or manage the country's marine resources. The resources in the Exclusive Economic Zone (EEZ) are virtually unknown. Hydrographic charts were unavailable. Coastal current patterns were unknown. There were no means to enforce marine laws. Small mesh beach seines were used extensively which were resulting in a large kill of juvenile fish, thus impairing the overall catch. Adequately trained specialists in marine science were unavailable. Efforts by the authors to discuss the current status of the industry with Dominican fishery officials have proved unsuccessful.[4]

Like several Caribbean islands, the fishing industry has been adversely affected by hurricanes. Dominica has been particularly hard hit. Hurricanes David (1979) and Lenny (1999) have been especially devastating.[5] Fishery Division (FD) officials report that Hurricane David "... devastated the industry. It wiped away about 90 percent of the fishing fleet, destroyed or made it temporarily impossible to use 50 percent of all fish landing sites. Even now (1989), some sites are still recovering ..."[6] Dominica's moribund fishing sector was expected to benefit from the new fishing complex at Rosseau which was opened in July 1997. The complex plays an important role in fisheries marketing and distribution.[7] The old fishing

The industry produces approximately 2.8 percent of the country's gross national product, estimated by the Eastern Caribbean Bank in 1998 to have been approximately $265 million.[9] Dominica does not normally export fishery products and there are thus no export earnings (Caribbean Overview, appendix F1b). The country normally imports about $1.3-1.7 million of fishery products annually. Especially large imports of $3.0 million worth of fishery products were reported in 1995 (Caribbean Overview, appendix F1a). The most important commodity is normally cured fish which is used for many traditional dishes dating back to a time when salting fish was the only way of preserving it.

II. Species

The authors know of no published studies describing swordfish behavior specifically off Dominica.

A. Spawning

The spawning grounds for swordfish are primarily deduced by the location and abundance of swordfish larvae. One 1983 study reported that there is relatively little spawning within the Caribbean itself, although some limited spawning does take place south of Cuba. Considerable spawning activity is reported off western Cuba, both in the Yucatan and Florida straights (Cuba, figure 4). There is also some spawning around the Lesser Antilles, primarily from north of Anguilla to St. Lucia. The larvae found in the Lesser Antilles are both small and large sized. The lesser numbers of small larvae suggest that spawning is less intense than in the western Caribbean off Cuba. The numbers of large larvae found around the Lesser Antilles suggest that larvae spawned locally are retained there or recruited from adjacent regions.[10] A 1998 analysis shows a similar pattern of larval concentrations in the Gulf of Mexico and U.S. southeastern coast, but some more limited concentrations off the northern islands in the Lesser Antilles (Venezuela, figure 10).[11]

B. Migrations

Available information on swordfish migratory patterns concerning the northeastern Caribbean are discussed in the Anguilla chapter of this report. The authors know of no swordfish tag returns immediately around Dominica, but there have been several around the islands further north.

III. Grounds

A. Oceanography

Dominican fishermen, like many Caribbean fishermen, face very different fishing conditions off their two coasts. One research group conducting test fishing, for example, found the thermocline depth off Dominica's Caribbean coast was 40 meters (m) while off the Atlantic coast it was nearly 75 m--even though the sea surface temperatures were an identical 80.2°F.[12] NOAA during 1991-94 conducted 10 cruises during different seasons to assess the current structure and water mass properties in the southern passages between the Caribbean and Atlantic from Dominica south to Trinidad.[13] Venezuelan researchers report that the main inflow into the Caribbean occurs between Dominican and St. Vincent (21.5 Sverdrups).[14] Other researchers report stronger current flow more to the south (Caribbean Overview, appendix B1).[15]

B. Topography

Dominica is the most northerly and largest of the Eastern Caribbean Windward Islands. It is situated with an east coast facing the Atlantic and west or leeward coast facing the Caribbean.

East coast: The shelf along Dominica's eastern or Atlantic coast is about 10 kilometers (km) wide. The greatest extent of shallow water is off the eastern coast north at Castle Bruce where the 100 fathom line is 4 km offshore. There is a broad expanse to the east of relatively shallow water before reaching deep Atlantic water. The 1,800 m isobath is about 60 km east of Dominica. There is also a shallow bank with water only about 80 m deep located about 30 km to the southeast, the Macouba Bank. Dominican fishermen in their small traditional boats have trouble reaching this and other offshore areas.[16] The Macouba Bank is, however, heavily utilized by Martinique fishermen.

West coast: The ocean topography off the western leeward coast is very different. The shelf is extremely narrow, in some locations less than 5 kilometers. The 100 fathom line along the western and southern coast is only about 1.2 km offshore. Within 20 km the bottom falls off into the Caribbean Grenada Basin with depths exceeding 3,000 meters.

Dominica is a mountainous island of volcanic formation. It has rugged, steep terrain with a very narrow coastal plain. High steep mountains are heavily forested. The EEZ is about 7,700 square km, but there is only 900 square km of shelf.[17] Unlike many other Caribbean islands, coral reefs off Dominica are quite small and found only at a few locations. Coral formations are located at Scotts Head on the southwestern tip of the island. There are also small coral formations at a few locations off the east coast and at Douglas and adjacent bays along the northwest coast. There are few estuarine wetlands. The largest is located in Cabrits National Park. Dominican beaches are mostly narrow and consist of gravel and black volcanic sand. Many of the beaches are black owning to the volcanic formation of the islands and the paucity of coral reefs. Coral tends to produce lighter colored sand. Beaches are used by artisanal fishermen for landing sites and areas for hauling out their

boats.[18]

Dominica itself is a small island of only 751 square km in area. More than half of the island is unsuitable for agriculture because of the mountainous terrain. Some relatively flat areas are found in the flood plain of the major rivers. The tidal range is about 0.6 meters.

C. Fishing grounds

Dominican fishermen fish all around the island, but concentrate their effort along the more protected western coast.[19] The fishermen conduct two principal fisheries:

Demersal: Dominican fishing take demersal species in inshore shallow and reef waters. The species taken include groupers, snappers, redfish, grunts, and other reef fish.

Pelagic: Artisanal fishermen may venture out perhaps 25 km off shore during the pelagic season (November through June), but usually fish closer to the island.[20] Fishing can be conducted all around the island, but is often concentrated in the northern channel separating Guadeloupe and Dominica and the southern channel between Dominica and Martinique. The species taken include tuna, bonito, dorado ("dolphinfish"), flyingfish, billfish (especially sailfish), king mackerel ("kingfish"), and a variety of others. Other pelagics are also taken, primarily off the western coast. Species include ballyhoo, bonitos, jacks, sprats, and other species.[21] One observer reports that most of the longlining is conducted off the island's west coast.[22]

Some of the most productive fishing grounds off Dominica are located 50-65 km east of the island. This was traditionally beyond the reach of the small open boats, insufficiently powered, boats.[23]

The Government is promoting greater exploitation of the country's Exclusive Economic Zone (EEZ) and to support investments to encourage fishing for deeper slope bank fish and off shore pelagics.[24] The Agricultural Industrial Bank (AID-Bank) has made two unsuccessful loans for commercial longlining. Bank officials are unsure why the ventures failed. They speculate that Dominican waters may not be as productive as those of other neighboring island like Guadeloupe, Martinique, and St. Vincent. There are, however, other possibilities such as lack of experience and training among others.[25]

IV. Fleet

A. Artisanal

The fishing industry in Dominica is a small, artisanal fishery. The fishermen mostly deploy boats under 10 m of a open, Boston whaler design. The authors have received widely varying reports concerning the size of the local fleet. Observers in the late 1970s noted 500-720 boats, more than half at the time were not powered with outboard motors.[26] A 1990 report estimated that there were 765 boats operated by 1,850 fishermen. FD officials indicated that more accurate data on fishing vessels were possible as a new vessel registration system went into effect on October 1, 1989.[27] Some observers based on work in 1996 estimated the artisanal fleet at 2,000 boats, operated on both a part- and full-time basis.[28] Nearly 70 percent reportedly work on a full-time basis.[29] The fleet size fluctuates seasonally and in 1999 was estimated by the FD to be much smaller than the 1996 estimate--approximately 1,000 boats.[30]

The Dominican fishing fleet has suffered grievous hurricane damage in recent years. The artisanal fishing fleet was almost totally destroyed by a hurricane in 1979.[31] Hurricane Lenny in 1999 also destroyed large numbers of boats as well as shore facilities. Senior Fisheries Officer Harold Guiste reported that the industry suffered approximately $1 million in damages. His figures indicated 52 boats were seriously damaged and 44 outboard engines destroyed, as were 1,606 fish pots (traps) and 53 artisanal tuna longlines.[32]

The traditional Dominican boats were almost entirely 4-7 m in length.[33] These small boats have extremely limited ranges and limit fishing to day trips. Dominican artisanal fishermen have traditionally deployed two types of boats, but a new modern "transition" boat has become popular in recent years. The FD is encouraging fishermen to shift to new fiberglass (glass reinforced plastic--GRP) "transition" craft. A recent survey of Dominican fisheries indicated that about 55 percent of the fleet was composed of "canoes". Presumably that means primarily the traditional dugouts. Most of the remaining boats were whalers, also called dories.[34] The number of the new "transitional" craft were not mentioned.

Dugout canoes: Dugouts canoes were once operated from locations all along the coast. They usually were made in three sizes: 5 m, 6 m, and 7 meters. The larger ones were often deployed along the eastern coast. They were made out of a gommier trunk. Their rugged construction made them highly adaptable

Photo 2.--Fishermen in the 1990s have worked with several small longliners like the "Maverick". A second, smaller longliner is tied up behind it. Riviere Sebastian

for use from isolated beaches. The use of these traditional canoes declined significantly in the 1980s.

Keelboats: Keelboats were through the 1970s primarily operated from the northern part of the island, particularly Portsmouth, Capuchin, Vielle Case, Anse-de Mai, Calibishie, Woodford Hill, Wesley, and Marigot. These boats, usually of the Boston whaler design, were of strong, robust construction. They are powered by outboard motors and are generally 4-8 m in length.[35] Some are as large as 10 meters.

Transition craft: The FD in the late 1980s began encouraging fishermen to adopt new "transition craft," Yamaha-designed 8-m GRP boats. The vessels are more stable at sea and have larger carrying capacities than the traditional craft. They are called transition craft according to a FD official because they will take "... us from the primitive dug-out canoe to a fishing vessel that is more reliable; one that affords the fisherman a greater degree of safety and accommodate a more efficient means of fishing."[36] The vessels are increasingly being adopted by Dominican fishermen.[37]

Dominican fishermen have attempted some artisanal longlining with small boats. A few keelboats have been rigged for longlining. The Newtown Fisheries Cooperative longlined with two keelboats in the 1990s, *Alicia* and *Fhaine*--both 10 m long. The Newtown Cooperative is the only Dominican cooperative that has deployed longliners, but about six independent fishermen also deployed smaller keel boats. The authors do not have a complete list, but one such boat was the *Ceasar Ulè*.[38]

The artisanal fishermen are interested in upgrading their boats. One reason is to acquire larger boats which can be used to deploy small longlines. Several fishermen are interested in fiberglass pirogues, but can not afford to replace their existing boats.[39]

B. Commercial

The Dominican Government has supported the development of a commercial fishery through demonstration projects. Several Dominicans have attempted to initiate commercial fishing operations in the 1990s. Not all have been successful, but two longliners were reportedly active in 2000.

Demonstration: A 1990 report indicated that fishermen were only operating two boats from Dominica that were larger than the normal small artisanal vessels--a 12 m and a 14 m vessel. The vessels were rigged for longlining and deployed by the Government for training and demonstration.[40]

Caribbean Flag: The training vessel *Caribbean Flag* is operated by the Martinique Regional Council Project. (See the Martinique chapter of this report.) It is a 9-m fiberglass longliner built in Martinique. It has three holds, one at the in the front and two at the stern.[41]

Kate: The 9-m longliner *Kate* works out of Rosseau. It entered the fishery about 1992.

Maverick: The *Maverick* was active in the 1990s, but is not now operating in Dominica. This appears to be one of the two vessels that the AID-Bank financed, but the owners could not maintain the payments.

Nature Island: The *Nature Island* was active in the 1990s. The vessel occasionally targeted swordfish. One 1994 trip resulted in catches of about 2 tons. The

vessel in 2000 was not being operated out of Dominica.[42] This appears to be one of the two vessels that the AID-Bank financed, but the owners could not maintain the payments.

Silver Dolphin: The *Silver Dolphin* was originally given to the Dominican Government by Taiwan in the late 1980s for training and exploratory fishing.[43] The vessel was damaged in a 1995 hurricane and washed ashore and subsequently sold by the Government.[44] A subsequent report indicated that the vessel was co-owned by an Antiguan and a Dominican. During the 1990s it was making fishing trips of 3-4 days. The Dominican owner purchased the Antiguan share in 1998 and the vessel returned to Dominica.[45] It was in 2000 being used as a cargo vessel.[46]

Silver Star: One longliner, the 16-m *Silver Star*, was flagged in Dominica and operated out of Antigua in the mid-1990s (appendix A).[47] Another report indicates that in 2000 it was working out of Portsmouth.[48]

Others: Another observer reports that one or two small longliners may be operating on Dominica, but did not have details.[49]

Several vessel owners have experienced difficulties operating out of Dominica. There continues to be interest on Dominica, however, in expanding commercial longline operations. The FD reports that in 2000 they had five applications from fishermen who wanted to initiate longline operations.[50] It is likely that these applications will be approved by the Government, but it is unclear if the fishermen have the needed financing to actually acquire and deploy longliners.

C. Recreational

One of the more established companies operating sport fishing boats is Game Fishing Dominica. They operate the 10-m *Independence of Dominica*. It is equipped with state-of-the-art tackle and electronics like Penn International Shimano Tiagra reels.[51] Another charter operator, Rainbow Sportfishing, operates the *Arwenne*.

V. Shipyards

Dominica has no shipyards that are capable of building or maintaining modern commercial longliners. Traditional dugouts and wooden keelboats were built by local shipwrights. Many of these gifted craftsmen have now retired. One report indicates that wooden boats are no longer built on the island and that it is now even difficult to find craftsmen to repair them. Many Dominican fishermen instead buy fiberglass boats from the neighboring French islands.[52]

Photo 3.--Taiwan donated the "Silver Dolphin" to the Dominican Government and many fishermen received longline training on it. It is now being used as a cargo vessel. Riviere Sebastian

VI. Fleet Operations and Gear

A. Commercial

Several commercial longliners have been deployed from Dominica, but with mixed results. Most have been deployed by foreign countries as part of fishery development projects. Only limited information is available on the fishing operations involved.

Pilgrim: The British in the 1970s donated the *Pilgrim* to the Dominican Government for training and test fishing, but little was apparently accomplished.

Newton Cooperative: The Newtown Fisheries Cooperative operated a 20-m longliner in the late 1980s, but eventually had to sell it because of high maintenance costs of the converted steel-hull vessel.[53]

Silver Dolphin: The Taiwan Government donated the *Silver Dolphin* to Dominica in the late 1980s. The initial purpose was for research, but the FD could not afford to operate the vessel solely for research and test fishing. Fishery officials report that the vessel was used for a variety of other purposes: fisheries training, surveillance, and locating distressed boats or men washed overboard. While the *Silver Dolphin* proved useful, officials still discuss whether the vessel was well utilized.[54] The training aboard the vessel did help to promote longline fishing by the artisanal fishermen.

Caribbean Flag: Another Taiwan longliner, *Caribbean Flag*, is currently registered in Dominica, but operated by a Martinique-based fisheries development program.[55] Dominican officials report that the *Caribbean Flag* served a useful purpose. The vessel was based in Rosseau and enabled fishermen from all over the island to receive longline training. It was part of a decentralized effort to provide training to fishermen in different locations. One particularly helpful session was held in the north of the island where fishermen who were mostly from the Portsmouth Fisheries Group, and unable to come to Rosseau, were trained.[56]

Nature Island: This AID-financed longliner was deployed for largely seasonal operations during the mid-1990s. The fishermen used local ballyhoo and imported squid for bait. The primary target species was yellowfin tuna, but some swordfish sets were made. Hooks were set at about 18-65 meters.

A Taiwan masterfisherman conducted successful longline operations on the *Silver Dolphin* year round. This surprised the local fishermen who were only used to find tuna from January to July and assumed these species were not present the rest of the year. The Taiwan masterfisherman was able to find tuna during the off-season by setting lines deeper than the artisanal fishermen had been fishing. The Taiwan master fishermen concluded that tuna off Dominica make a vertical migration during the off-season, seasonally following the thermocline. The vessel was used for 4-6 day trips.[57]

The authors know of only limited commercial longlining currently underway in Dominica, although about seven artisanal longliners were active. Several Dominican fishermen appear to be planning commercial longline operations. Five fishermen in 2000 requested permits for a longliner. It is unclear how many of these fishermen will actually be able to initiate longline operations. Officials indicate that the high capital invest required to purchase and rig a longliner is one factor preventing Dominica from initiating longline operations. Unlike earlier projects, new

Photo 4.--These Dominican fishermen are working aboard the "Silver Dolphin" to learn longline methods. Riviere Sebastian

Dominican fishermen who have at least a basic familiarity with longlining. Officials report, however, that longline gear is not readily available on Dominica and the boats currently operated by the fishermen are generally too small to accommodate the gear. Some fishermen are interested in acquiring fiberglass boats, but at this time do not have the needed investment capital.[58]

Photo 5.--Quite a number of Dominican artisanal fishermen have acquired experience in basic longline methods during recent years. Riviere Sebastian

B. Artisanal

The primary fishing activity on Dominica is conducted using small craft, both traditional dugouts and whalers/dories, powered by outboard motors. The small boats used by Dominican artisanal fishermen have extremely limited ranges which restricts fishing to day trips. Many of the fishermen only fish part time, supplementing their income by agriculture. Most of the full-time fishermen are located at Rosseau and Scotts Head.[59]

Dominican artisanal fishermen conduct both demersal and pelagic operations.

1. Demersal

The demersal fishermen primarily deploy traps ("pots"), but hand lines and gill and trammel nets are also used. Lines are set as deep as 75 meters. No detailed stock assessment data exists, but anecdotal reports from the fishermen complain of declining catches. The Government is especially concerned about the situation along the western coast where the shelf is quite narrow and where most of the island's fishermen are located.[60] The harvest possible from the limited stocks on the narrow shelf are impaired by over fishing. There have also been reports of fishermen using dynamite, an especially destructive practice.

Photo 6.--Dominican fishermen, advised by a fisheries extension officer, are working board the "Silver Dolphin"--donated by the Taiwan government.

2. Pelagic

Pelagic fishermen harvest the great bulk of the Dominican fisheries catch. Dominica's pelagic fishermen have traditionally set a variety of gear. Longlines were, however, not deployed until recently.

Beach seines: The ballyhoo beach seine was once the most common pelagic gear used by Dominican fishermen. About 200 were deployed on Dominica during the 1970s. They varied from 250-400 m in length. They were generally deployed by two boats and pulled ashore by crews of 6-10 men. Fishermen along the western coast have also set a few large beach seines, primarily to catch jacks, bonitos, and mackerels. Fishery officials believe there was a "significant destructive

element" to beach seines because small mesh sizes resulted in a large catch of juvenile fish--both pelagic and demersal.[61] While the use of beach seines have declined somewhat, they are still more important on Dominica than on many other Caribbean islands. About 30-40 beach seines of various size were in use during 2000, mostly along the western coast.[62]

Photo 7.--A large part of the longline catch reported by Dominican fishermen was yellowfin tuna. Swordfish catches are unusual. Riviere Sebastian

Gill nets: Fishermen also deployed surface gillnets. These were often deployed for flying fish. This gear can result in extremely high catches of flying fish during the migratory season. Dominican fishermen experience, however, difficulties selling particularly large catches in the island's small domestic market.

Hand nets: Hand nets were also used to catch flying fish. The fish are attracted by chumming and the congregating fish then scooped up with hand nets.

Handlines: Fishermen also deployed surface handlines for large pelagics. These operations are sometimes conducted in conjunction with flying fish operations. The fishermen target dorados, tunas, and king mackerels. Vertical handlines are deployed for demersals.

Troll lines: Troll lines were extensively used in the channels separating Dominica from Guadeloupe in the north and Martinique in the south as well as along the eastern coast. A typical line and leader may be 50-70 m long. Fishermen generally deploy two lines without a sinker as far as possible beyond the shelf drop. The effectiveness of these operations are limited by the small size and limited range, as well as the insufficient powering of the boats.[63]

Photo 8.--While Dominican fishermen took only small quantities of swordfish, they reported notable yellowfin catches. Riviere Sebastian

Longlines: Dominican artisanal fishermen were not using longlines in the 1970s and early 1980s, but longlines were identified by Dominican officials as a productive gear which should be promoted.[64] One 1990 report also failed to mention longlines being used by the fishermen.[65] A few Dominican fishermen in the 1990s, however, have begun using longlines.[66] The Taiwan assistance

program played an important role in introducing longlines. The fishermen have been trained aboard a longliner donated by the Taiwan Government.[67] (See "Foreign Aid".) The fishermen began deploying small longlines, 4-8 km long.[68] There are in 2000 about seven full-time longline fishermen which use lines 15-30 km long.[69] Quite a number of additional individuals have small longlines which they use on a part-time basis. Dominican longline fishermen in the 1990s go out late in the morning to set their lines. A Taiwan masterfisherman working with the local fishermen found that better yields could be obtained by setting early in the morning before dawn. One report indicated that a typical 7.5 m open boat with a 25 hp outboard and a crew of 5-6 men sets a 16-km longline. Catches might consist of 50-60 yellowfin tunas averaging about 35-45 kg each when the lines are set before dawn.[70] Swordfish are occasionally taken. Billfish may make up about 7 percent of the catch. The shark bycatch is limited, only about 3 percent.[71] Most of the artisanal longline fishermen are independents, but the Newtown Fishermen's Cooperative has used two of its keelboats for longlining.[72] Officials report that a number of other fishermen would like to try longlining. The high cost and scarcity of longline gear on the island has limited the number of fishermen who have been able to launch such operations.[73]

Fishermen have in recent years improved their handling procedures. Large pelagics (tunas, swordfish, billfish, and sharks) are now normally eviscerated and bled at sea. This is not easy on a small boat. One way of bleeding the catch is to leave it in the water after eviscerating it. This can, however, draw sharks and is only practiced by a few fishermen.[74]

C. Recreational

Dominican recreational fishermen target marlin, tuna, wahoo, dorado, king mackerel (king fish) and other oceanic pelagics. The charter boat operators claim that since the fishery has only been developed in recent years, they still have "virgin" grounds.[75] They operate on numerous banks and "drop-offs" on the Atlantic side and more placid waters on the Caribbean side. They practice tag and release fishing.[76]

Only a few sport fishing tournaments are held on Dominica. The only one known to the authors is the Dominica International Sport Fishing Tournament. The first one was held in 1996 and it has since been conducted annually. Dates have varied from May to July. The 1999 tournament was held on May 6-9, 1999. Prizes are offered for each billfish species and swordfish as well as smaller pelagics like dorado, yellowfin tuna, wahoo and king mackerel. Reports from the first tournament in 1996 showed that 28 boats participated from the neighboring islands of Antigua, Dominica, Guadeloupe, Martinique, and St. Lucia. The largest fish caught was a 135 kg blue marlin.[77]

One of the marine recreational activities on Dominica is diving at the Soufriere/Scott's Head Marine Reserve. It is located in an attractive "U" shaped bay near the fishing village of Soufrieré. The Government set up the reserve in 1994, but is still developing the necessary regulations. The marine reserve concept was promoted by Fisheries Division Adviser Nigel Lawrence and made part of the OECS model Fisheries Development Plan for member states.[78]

VII. Catch

Dominican catches of oceanic pelagics arc limited, but have increased somewhat in recent years. Dominican fishermen report small tuna catches (yellowfin, skipjack, and blackfin). Most of the remaining pelagic catch is wahoo and king mackerel. There are no reported swordfish catches, but fishermen are known to have taken some.

1988-89: The yellowfin catch totaled only 3-7 t during 1988-89 (appendix B2). There are no reported swordfish catches

1990: Fishermen reported excellent tuna catches in 1990, 18 t of yellowfin and 60 t of skipjack (appendix B2).

1991: Tuna catches decline in 1991. The yellowfin catch totaled only 12 t, but still above 1988-89 levels (appendix B2).

1992: Fishermen improved tuna catches in 1992, taking 23 t (appendix B2).

1993-94: Fishermen reported record yellowfin catches of 30-31 t during 1993-94 (appendix B2) Skipjack catches declined in 1993, but increased to 43 t in 1994, still below the 1990 record (appendix B2).

1995: Yellowfin catches declined in 1995, but blackfin catches increased (appendix B2).

1996-98: Dominican officials has not provide FAO catch data broken down by species for these years.

1999: Dominican fishermen reported very substantial increases in tuna catches over the levels reported in 1995. The yellowfin catch of 80 t was especially notable, but increases in skipjack were also important as were increased wahoo catches. The overall pelagic catch was 330 t, a record for Dominica (appendix B2). As data was not available for 1996-98, we are not sure just when these increases actually occurred. The authors do not have full details, but believed the improved landing and markct facilities at Rosseau played an important role in the increased catches reported.

2000: Current catch data for Dominica is not available, but may have been adversely affected by thc 1999 hurricane damage to the Government Fisheries Complex at Rosseau which had greatly improved the market available to the fishermen and had stimulated fishing effort.

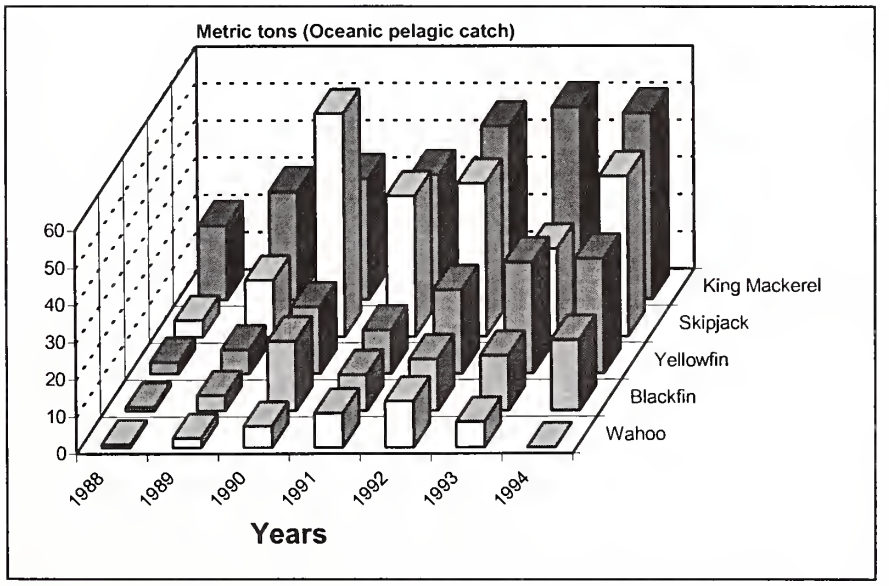

Figure 3.--Most of the Dominican pelagic catch is king mackerel or wahoo and skipjack tuna, primarily taken by trolling.

VIII. Ports

Dominican fishermen have to contend with some of the worst infrastructure in the Caribbean. A FD official speculated that "... if you were to take all of the fishermen from the other OECS countries and make them tour Dominica, I am sure about 99 percent of them would not want to fish out of Dominica."[79] Officials indicated in 1989 that there were 42 landing sites around the island. Most not only lacked even basic infrastructure, but many did not even have sand which makes beaching artisanal craft easier. Many fishermen had to contend with steep jagged rocks.[80] Dominican officials during the 1990s succeeded in making improvements at many sites, especially building a new port at Rosseau. Notably, Dominican fishermen reported substantially increased catches after the Rosseau facility was opened in 1997 (appendix B2). Unfortunately many of the new facilities were destroyed by Hurricane Lenny in 1999.

The largest town and port on Dominica is Rosseau, located along the southwest coast. Many of Dominica's larger fishing vessels operate from Rosseau. The $23 million Rosseau port complex was built with Japanese funding and completed in 1997. Unhappily for the Dominican fishermen, the facility only operated for about 2 years. It was reportedly heavily damaged by Hurricane Lenny in November 1999. Some of the most severe damage

was to the new fisheries office and berthing facilities.[81] Dominica's fisheries complex experienced extensive damage, with subsidence to the ramping facility, flooded offices, and reinforced, galvanized steel retaining gates torn from their brackets. While Fisheries Officer Guiste could not estimate the cost of repairs, he estimated that the ramping facility alone would take tens of thousands of U.S. dollars to repair.[82]

Fishermen operate from a number of small villages. There are over 40 fishing beaches around the island from which vessels are operated. The largest number of fishermen, over 15 percent of the total in 1999, were operating from Scotts Head at the southern tip of the island.[83] Another major center is Soufriere along the southern coast. Other important landing sites are Portsmouth, Marigot, Rosseau, and St. Joseph. There is still very limited infrastructure and no landing facilities at these sites. Launching and beaching the artisanal craft is often accomplished only with great effort

Photo 9.--Dominica has made some improvements in port facilities during recent years. Workers here are completing the new jetty at Salisbury. Riviere Sebastian

IX. Transshipments

Swordfish is not transhipped through Dominica.

X. Processing and Products

Swordfish is not processed on Dominica.

XI. Companies and Cooperatives

A. Companies

The authors have little information on Dominican fishing companies. One report indicated that there were two cottage-operations processing fish in 1999.[84] The Japanese-financed fisheries complex in Rosseau plays a key role in the Dominican fishing industry. After it was opened in 1997, it quickly became the center of the island's fishing fleet. About 30 percent of the catch was being landed there by 1998. The FD would also truck fish to the complex from 6-7 landing sites on both coasts. Previously substantial quantities of fish was being wasted because it could not be sold. The complex provided fishermen a greatly improved market for their catch which encouraged them to expand their fishing effort. Officials report that fish imports from St. Vincent and other countries dropped sharply. The damage to the complex in 1999 meant that Dominica has had to resume fish imports.[85]

B. Cooperatives

The first fisherman's cooperative was organized in 1963 and in 1975 has 345 members. The coop experienced financial difficulties, but helped many fishermen buy their own outboard motors.[86] A 1984 report indicated continued Government support for the cooperatives. An umbrella organization, the Dominican Fisheries Cooperative Society Ltd., was working with cooperatives that were being organized in various districts.[87]

Photo 10.--Facilities like this which can be used to mend nets or work on small boats have been built for the artisanal fishermen at several landing sites around the island. Riviere Sebastian

About seven fishery cooperatives existed in Dominica during 2000. Most are not very active:

Dominican Fishery Cooperative (DFC): The largest fishery cooperative in 2000 was the DFC. It reportedly had 472 members.[88]

Newtown: One of the most successful is the Newtown Fisheries Cooperative. Newtown is located about a kilometer from the capital, Rosseau. The coop was organized in 1982. There are currently about 40 members, both full-time or part-time fishermen operating keel boats. Membership requires the purchase of at least three shares of the cooperative at EC$20 (about $9). The fishermen use a variety of gear, including longlines, targeting both demersal and pelagic species.[89] The cooperative is known to have unsuccessfully attempted commercial longlining in the late 1980s.[90] Coop members in the 1990s harvested a wide variety of species, including flying fish, dorado ("dolphinfish"), snappers, groupers, and other species all year round. The coop also rigged two of their 10-m keel boats (*Fhaine* and *Alicia*) with longlines. They are reportedly the only Dominican cooperatives to have done so, although some independent fishermen deploy longlines. The Newtown Cooperative deployed 8-10 km lines and used ballyhoo for bait. The coop purchases the ballyhoo from a few local fishermen still using dugouts on inshore grounds. The Newtown fishermen targeted tuna, but also took dorado, billfish, a few swordfish, and a variety of other pelagics. They reported particularly good tuna catches from June through December. They generally operate about 30-80 km west of Rosseau in the Caribbean. They never go east into the Atlantic. They tend to go straight west so as not to interfere with the Scotts Head Cooperative which operates to the south. The coop's last longlining was conducted in 1997 and they have since experienced a series of difficulties which have prevented further longline operations. Engine problems developed in 1998 and the coop was unable to fix them before the season was over. In November 1999 Hurricane Lenny struck the island and destroyed large numbers of fishing vessels. Several of the coop's boats were destroyed, including the *Fhaine*. The *Alicia* was badly damaged, but has since been repaired. The longline gear and 260 hp motors on both vessels were lost. It has cost the coop $2,600 to repair and rerig the *Alicia*, but they were only able to afford two much small motors. The coop has always used locally built wooden boats, but shipwrights no longer build wooden boats on Dominica and it is even difficult to find craftsmen to repair them. Future boat purchases will probably be made from companies building fiberglass boats on the neighboring French islands.[91]

National Fishery Cooperative (NFCo-op): Some industry observers have suggested closing existing cooperatives and organizing one umbrella national coop--the NFCo-op.

Some Dominican observers are critical of the cooperative movement. As elsewhere in the Caribbean, there are problems associated with joint ownership and operations. One FD official reports, "I have my own opinion on fishery cooperatives. The coops do not seem to work very well, at least not on Dominica. Fishermen don't seem to like attending meetings to discuss their business. This is a very serious problem since it means that in many cases people other than the fishermen are leading the industry."[92]

C. Associations

Dominica has an active environmental organization, the Dominican Conservation Association (DCA). The DCA has been active in marine affairs. It has also strongly promoted ecotourism like whale watching. Another group is the Small Project Assistance Team (SPAT). The SPAT has been active on environmental issues and education and has helped promote small-scale development projects.

XII. Markets

A. Domestic

Virtually the entire Dominican catch is used to supply the domestic market.[93]

Government Fisheries Complex: The principal market for seafood in Dominica was briefly the new Government Fisheries Complex which opened in Rosseau during 1997. Some fishermen land their catch at the complex where the fish is cleaned and then marketed. The FD also trucked in product from seven important landing sites. Operations at the Complex, however, have been impaired since Hurricane Lenny in 1999. The Government plans to repair the damage as well as build two additional complexes. The Japanese have committed to funding the project. Efforts to promote sales at Rosseau have been greatly frustrated by the damage caused to the new port facilities by Hurricane Lenny in 1999.

Landing sites: Much of the Dominican catch has traditionally been sold informally at the major landing beaches. A 1984 report indicated that most of the catch was sold fresh at beach sites.[94]

Stands: Fish is also sold at roadside stands near the major population centers.

Brokers and fish stores: Seafood brokers were almost non-existent. There are few retail fish stores.[95]

Supermarkets: Three supermarkets in Rosseau handle seafood: HMV Whitchurch, J. Astorphans, and A.C. Shillingfort.

Markets: A few of the larger towns such as Portsmouth and Marigot have central markets where fish is sold. These markets are often only run on certain days such as Tuesday and Saturday.

Vendors:: A 1999 report probably using older data indicated that there were about 100 seafood vendors or hawkers.[96] A more recent report suggests that the number of vendors has declined sharply.[97]

The Government in the 1970s had maximum prices.[98] It is unclear to what extent the prices were adhered to or the effect that they had on production and consumption. Government imposed price ceilings often have the unintended effect of discouraging production and reducing supply which can actually drive up prices. Information on the results of the Dominican Government price controls, however, are unavailable.

Swordfish and other large pelagics are usually displayed as eviscerated trunks. The customer simply asks for a specific quantity which is then cut off the trunk. These species are sometimes served grilled but the most common preparation is boiled in a sauce.

B. Trade

1. Exports

Dominica does not export swordfish (appendix C1). A recent report suggested there are no seafood exports at all.[99] FAO data also shows no seafood imports (Caribbean Overview, appendix F1b). U.S. data shows occasional small fishery shipments, including 0.9 t of fresh yellowfin tuna in 1996 (appendix C2).

2. Imports

Dominica does not import swordfish. The country does import small quantities of other seafood. The most important commodity is salt cod.[100] Dominica imports small quantities of fishery products from the United States, primarily canned fish. The authors note an unusual shipment in 1997, 10 t of fresh cuttlefish. This could have been bait for the longline fishermen, although no details are available.

XIII. Government Policy

The Dominican agency responsible for fisheries is the Fisheries Development Division in the Ministry of Agriculture, Land, Forestry & Fisheries

A. Fisheries law

The basic Dominican fisheries law is the Fisheries Act of 1987 which gives the Government the authority to manage fisheries and among other provisions established a licensing program. The law also required fishermen to register their vessels and meet certain basic safety conditions. Three categories of vessels were established: artisanal/commercial, sport fishing, and foreign.[101] The law was in keeping with the harmonized approach of the OECS. The necessary implementing regulations went into force October, 1989.[102]

B. Limits

Dominica declared a 12-mile Territorial Sea in 1981.[103] The same law provided for a 200-mile EEZ. Dominican Prime Minister Eugenia Charles at the time of the declaration expressed concern over tiny Aves Island, a Venezuelan cay located about 145 km west of Dominica.[104] The Venezuelan possession of this cay will require Dominica to sign a marine boundary agreement with Venezuela and will severely restrict Dominica's EEZ projection west into the Caribbean. Dominica also proceeded to discuss its marine boundary with French officials because the French islands of Guadeloupe and Martinique are located to the north and south. These discussions addressed a reciprocal fishing agreement, technical cooperation, and French assistance.[105] A marine boundary agreement has been signed with France (for Guadeloupe and Martinique). A marine boundary agreement was signed with the European Union (EU) on July 6, 1993.[106] Dominica signed the Law of the Sea Convention in 1983 and ratified it in 1991.

C. Management policies

Dominican officials have strongly promoted the expansion of the country's fishing industry. The country appears, however, to have generally been one of the Caribbean islands least concerned about conservation issues. Dominica, in its quest to push for greater fishing capacity, has consistently questioned international and regional sentiment that the Caribbean region is experiencing serious fish stock reductions from overfishing.[107]

D. Promotion

Dominican authorities since the 1970s have seen the need to better use offshore pelagic stocks and reduce effort on the country's limited and heavily fished demersal resources. The Taiwan assistance program has played an important role in that effort. There are "automatic" duty-free subsidies for small outboard motors (75 hp or less). Subsidies can be granted on imports of fishing boats and gear, if approved by the FD. The Dominican Cooperative Society receives a rebate on fuel.[108]

The Agricultural Industrial Development Bank (AID Bank) is an autonomous statutory body with the Government holding a majority of the shares. It has provided loans for fishermen desiring to buy new boats as well as larger loans for shore-based facilities. Most of the vessel loans have been to artisanal fishermen so they can buy better boats. The average boat loan to the artisanal fishermen is $5,000-$20,000.[109] The fishermen have to get FD approval of their loan application to ensure that the project has a good chance of succeeding.

Two loans have been made for commercial longliners. One press report indicates that loans have been made for longliners.[110] The AID Bank confirms that two loans have been made for longliners, but that the owners have absconded with the vessels and are no longer paying the AID-Bank mortgage. One of the longliners has disappeared, but may be operating from one of the French Caribbean islands. The other longliner has been located operating out of Port-of-Spain on Trinidad. The Bank has, as a result, seized the homes and other securities the individuals involved placed for the loans. Given this experience the AID Bank is very reluctant to make any future loans for longliners. Bank officials believe the problems relate to the poor results achieved by the fishermen.[111]

E. Fishery Advisory Council

A Fishery Advisory Council (FAC) advises the FD. The FAC is composed of representatives from the seven fishery cooperatives, the Minister of Agriculture and the Environment, and the Chief Fisheries Officer. Dominican officials believe that the membership should be changed because so many cooperatives are barely functioning.

F. Flag-of-convenience

Dominican sources in 1999 reported that proposals were being floated at high levels in the Dominican Government to allow the flagging of foreign-owned fishing vessels. The United Workers Party Union (UWP) Government reportedly saw reflagging as an easy way of generating income. Two comparable programs have been tried earlier by the cash-starved Dominican Government. The country has administered a reportedly poorly regulated "economic citizenship" program involving cash payments for Dominican passports. There is also the country's questionable offshore financial sector. UWP officials noted that other Caribbean islands, especially St. Vincent, have flag-of-convenience or open registries.

One official reports that the UWP was considering the possibility of allowing foreign-owned vessels registrations to be handled by the local port authority. The port authority would have had little interest in enforcing fishery regulations. The proposal was discussed as a way for the Government to obtain more revenue. Some Dominican officials were opposed to the idea as regulation of these vessels would be difficult. One official noted that the Government has a difficult enough time dealing with the local fishing fleet. He added that the fishing boats would likely be much larger than the local vessels.

Dominica held elections in January 2000 and the UWP was defeated by the Labor Party. The new Labor Government appears to be more sensitive to environmental considerations. The new Minister of Agriculture and Environment, Atherton Martin, who is responsible for the Fisheries Division, has a strong record on environmental matters. Dominican officials report that the new Government is not planning to implement a flag-of-convenience registration program. Local observers, however, note that such a step can not be completely ruled out give the Government's severe financial crisis.[112]

G. Training

One FD official believes that Dominica needs a fisheries training institute, given the growing interest in fisheries and environmental issues. He recognizes that the Caribbean Fisheries Training Institute (CFTDI) exists in Trinidad, but it is not meeting Dominica's needs.[113]

XIV. Research

There is no known research on swordfish or other oceanic pelagics conducted by Dominica. Very little data is available even on catches of oceanic pelagic species. International organizations and foreign research institutes, however, have provided some assistance with collecting data needed for research and management as well as conducting a variety of fisheries and oceanographic studies. Venezuelan researchers are active as Venezuela's 200-mile EEZ includes Aves Island to the west of Dominica.

CARICOM: The Caribbean Community (CARICOM)'s principal fisheries activity is CFRAMP.

CFRAMP: CARICOM's Fisheries Resource Assessment and Management Program (CFRAMP) initiated a biological data collection program for large pelagics in 1995.[114] The overall CFRAMP program is discussed in the Trinidad chapter of this report.[115] One of CFRAMP's core activities was to compile data collected in the region. The program has, however been sharply curtailed in 1998-99. CFRAMP pelagic work has focussed primarily on small pelagics. Dominica was one of the few countries expressing an interest in swordfish to CFRAMP.[116]

Estación de Investigaciones Marinas de Margarita: The Venezuelan Estación de Investigaciones Marinas de Margarita (EDIMAR) has done oceanographic work around Dominica and the other islands of the southern Lesser Antilles.[117] EDIMAR has also done a great deal of fisheries work. The authors know of no work on swordfish, but there has been some work on tuna. These has significantly added to the information available on tunas in the southeastern Caribbean as a whole.[118]

Fisheries Division: Various observers attempting to assess Dominican fisheries have noted the lack of statistical data on catches and other basic information. Because of the need for basic data to manage fisheries, consultants have advised Dominican officials that a greater effort needs to be given to collecting catch data.[119] Some of the catch data that has been compiled is incomplete, often only containing data from some landing sites. Dominica in many years has not even submitted estimates of their catch to FAO (appendix B1) and provided no detailed catch data by species (1996-98).[120] Dominican officials contacted in the preparation of this report declined to provide statistical data or any other information on the FD's research or other activities.[121] The FD with FAO assistance has done some work with Fish Aggregating Devices

(FADs) constructed with local materials such as bamboo and car tires. The FADs are constructed and deployed by the fishermen. Some disputes arise among the fishermen who get upset if other fishermen work around their FADs. No Government regulations exist addressing this problem. The fishermen in 1988-89 were reporting better catches of tuna (yellowfin and skipjack) and dorado.[122] One FD official reports that FADs have been useful in helping fishermen catch oceanic pelagics.[123] Several fishermen along the western coast (especially Dublanc, Bioche, and Colihaut) and the northern coast (mostly around Portsmouth) in 2000 continued to report significant increases in catches of large oceanic pelagics (swordfish, tuna, king mackerel, and related species).[124]

Fisheries Development Limited: The British consulting group, Fisheries Development Limited, completed a $1.1 million fishery resources study in 1979. The study was financed by the Industrial Development Bank and the Institute of Industrial Technology.

National Oceanic and Atmospheric Administration: NOAA has done extensive oceanographic research throughout the Caribbean.[125] NOAA's National Weather Service is the principal agency involved with tracking the hurricanes that move into the Caribbean each year. NOAA's National Marine Fisheries Service through the Southeast Fisheries Science Center (F/SEC) does extensive work on many species of importance to Dominican fishermen, although the authors know of no specific F/SEC work on oceanic pelagics in Dominica. F/SEC is, however, preparing an assessment of whales in the Caribbean based on cruise observations. Dominican officials denied the NOAA research vessel permission to work in Dominica waters, presumably because of policy disagreements at the IWC. Other OECS countries like St. Lucia and St. Vincent allowed the NOAA researchers to work in their waters. The results of the NOAA research will prove useful to countries like Dominica with whale watching industries.

Universidad de Oriente: The Venezuelan Instituto Oceanográfico (IO) at the Universidad de Oriente in Cumaná has done substantial work on oceanography in the southeastern Caribbean around Dominica and the other islands.[126] IO biologists have also worked on fisheries, including swordfish and other highly migratory species. Much of this work is helpful in understanding swordfish behavior and trends around the islands of the Lesser Antilles.[127]

XV. Bycatch

Dominica has no swordfish fishery and there is thus no resulting bycatch. Some idea of potential Caribbean bycatch trends are available by assessing the data reported by the U.S. longline fleet in its Caribbean operations (Puerto Rico, appendices G4a-b).[128] While this data does not pertain specifically to Dominican waters or fishing strategies used by Dominican fishermen, it does provide potentially useful benchmark data.

A. Turtles

Only limited information is available on nesting, but the FD has identified leatherback nesting beaches. Dominica has not had a directed sea turtle fishery, but fishermen take small numbers. Fishermen from St. Lucia and Dominica as late as the 1970s were harvesting turtles on Venezuelan Aves Island, to the west of the islands.[129] Dominican officials estimated in 1990 that about 100 turtles annually were being taken incidentally by the artisanal fishermen.[130] Taking turtles is allowed, but there are closed seasons on each species.[131] Taking turtles out of season or egg poaching can result in fines of about $1,900 or a year in jail. One FD official reports that there are no studies accessing fishery interactions with turtles, but interactions have been reported with gillnets and longlines.[132]

B. Marine mammals

Dominican Fishery officials note that any assessment of the island's fisheries should at least touch on the whaling issue. Whaling is important in understanding Dominica's relationship with the Japanese. Dominica generally supports Japan at the International Whaling Commission (IWC). Some observers believe, for example, that this is the reason that the Japanese are providing about $100 million in fisheries assistance.

Reports from scientists and recreational fishermen indicate that a variety of marine mammals are present off Dominica. Species noted by the fishermen include sperm, humpback, and pilot whales. One whale photographer indicates that Dominica is the best place in the Caribbean to see sperm whales and has provided a detailed account of his experiences and other cetaceans that he has seen.[133] Humpbacks migrate south from northern feeding grounds. Humpback

movement between Caribbean islands, including Puerto Rico, has been noted.[134] Several small cetaceans, including spotted, spinner, bottlenosed and Rissos dolphins have been observed off Dominica. The spotted and spinner dolphins have been seen in pods exceeding 500 individuals.[135] Humpback pods of about 25 have been reported.[136] A Hubbs research cruise focusing on sperm whales spotted and reported on the behavior of Fraser's dolphins.[137] The species most commonly spotted by the longline fishermen is pilot whales.[138]

Fishery officials report that there are no marine mammal interactions with local fisheries. A few fishermen, however, target pilot whales with harpoons. There are no regulations protecting cetaceans in Dominica. Occasionally humpbacks found in shallow water are also taken. The whales are butchered and the meat sold in local markets.[139]

Some of the recreational fishermen offer whale and dolphin watching cruises.[140] Much of the whale watching is conducted by the dive boat operators. There are about 15 dive boats, about half of which do whale watching. They are most active in the winter months. The Government has developed guidelines for the vessel operators[141]

C. Seabirds

Seven seabirds are believed to nest on Dominica, but information is poor and only incomplete information is available on some of those species. Even fewer species nest on the Venezuelan cay, Aves Island to the west. Aves is, however, a particularly important nesting area (appendix D).[142]

Fishery officials note that Dominican fishermen do not report interactions with seabirds. Some fishermen do, however, use seabird sightings to locate flyingfish and other fish.[143]

XVI. International Relations

A. International relations

1. Multilateral

Dominica has pursued fishery relations through only a few multilateral organizations. The country's primary multilateral fishery contacts have been with the Organization of Eastern Caribbean States.

CARICOM: Dominica participates in Caribbean Community (CARICOM) fishery activities.

IWC: Dominican has been a member of the International Whaling Commission (IWC), withdrawing (1983) and then joining again (1992). Environmental organizations like Green Peace, the International Fund for Animal Welfare, and the World Wildlife Fund for nature allege that Japan is using its foreign aid to buy the votes of Dominica and several other eastern Caribbean island nations at the annual IWC meetings. Japanese officials deny these charges saying that foreign aid is not linked to other issues.[144] Dominican has worked to develop a common OECS position at the IWC meetings.

OECS: Dominica is a member of the Organization for Eastern Caribbean States (OECS) and has adopted the OECS harmonized fisheries law. Dominica also participates in the joint OECS fisheries enforcement program to jointly monitor their 200-mile EEZ.[145]

ICCAT: The authors have noted no ICCAT activities on Dominica.

2. Bilateral

Dominica's primary bilateral fishery relationship is with France concerning the neighboring islands of Guadeloupe to the north and Martinique to the south. There is also some fishing by distant-water countries in the northeastern Caribbean.[146]

European Union: The European Union representing France signed a reciprocal fishing agreement with Dominica in 1993 for artisanal fishermen. The agreement renewed an agreement previously signed in 1987. The agreement involved reciprocal rights for both Guadeloupe and Martinique fishermen. The EU agreed to provide ECU 1.65 million in financial compensation and to support a fisheries science program on Dominica. Dominica agreed to issue 200 licenses for fishing vessels from Guadeloupe and Martinique for various time frames, primarily for demersal species. The EU agreed to issue 20 licenses to Dominican fishermen.[147]

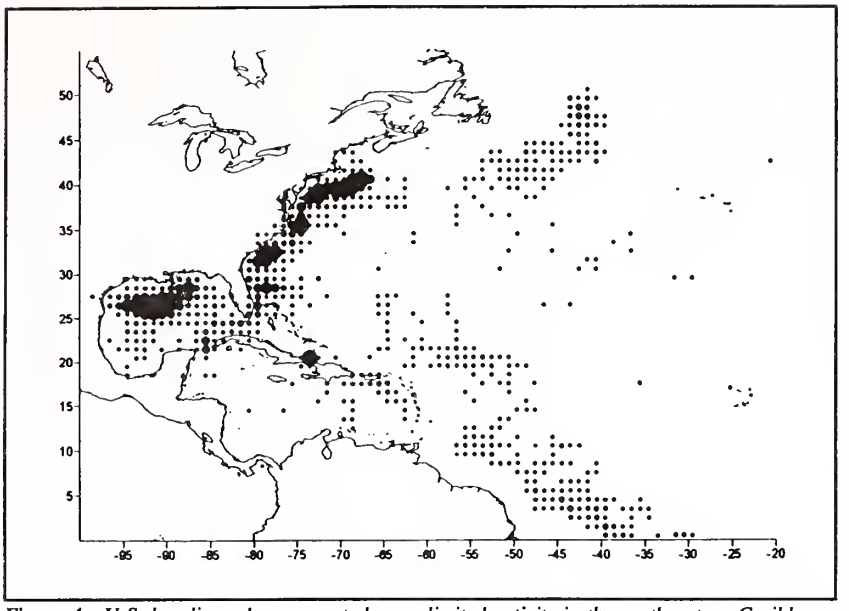

Figure 4.--U.S. longliners have reported some limited activity in the northeastern Caribbean, This map shows the location and density of reported effort in 1997. Jean Cramer

France: Guadeloupe and Martinique are overseas departments of France and French officials administer fisheries on each island. Prime Minister Roosevelt Douglas was convinced that it was important for Dominica to forge closer relations with both Guadeloupe and Martinique and saw fisheries as one of the many areas of cooperation which could be pursued.[148] Dominica negotiated a reciprocal fishing agreement with the EU (representing France). The agreement was an initiative supported by Prime Minister Douglas. Some Dominican fishermen, however, were very critical of the agreement.[149]

Guadeloupe: Large numbers of Guadeloupe artisanal fishermen operate off Dominica. Some are licensed under the terms of a reciprocal agreement negotiated by the EU in 1993. Dominican fishermen are sometimes intimidated by the size of the Guadeloupe fleet. Some fishermen complain of even being rammed by Gaudeloupe fishermen. Others report that the Guadeloupe fishermen sometimes carry guns. Guadeloupe officials have offered training to Dominican fishermen. These concerns and possible cooperation were addressed at a 2000 conference attended by Gaudeloupe and Dominican fishermen as well as fishermen from neighboring islands. Dominican participants, however, were concerned about the technological gap with the French fishermen One participant pointed out, "Because of the gap in terns of equipment and technology between Dominican fishermen and their French counterparts, a lot has to be done before any agreement on pelagic species could be signed."[150]

Guyana: A Dominican cooperative purchased the trawler *Issano* from the state owned Guyana Fisheries Corporation in 1980.[151]

Japan: Japan has deployed the largest longline fleet in the Atlantic. The Japanese reported catches in the northeastern Caribbean as early as 1961, but have not reported catches in recent years (Anguilla, appendix D). The Japanese, for example, reported no billfish and other swordfish fishing off Dominica during 1993.[152] There has been some more recent activity to the north of the Lesser Antilles.[153] Conservationist groups like Greenpeace continued to charge that Japan was attempting to "buy" the votes of Caribbean island countries like St. Vincent and Dominica.[154] Some estimates suggest that the Japanese are providing about $100 million to Dominica. The Japanese financed a fisheries complex which was built at Rosseau in 1997. Partly as a result, Dominica was able to reduce fishery imports. The complex was damaged by Hurricane Lenny in 1999. The Japanese have committed to rebuilding the complex and constructing two additional complexes at Plymouth and Marigot.

Korea: Korea also deployed a major Atlantic longline fleet. Operations in the northeastern Caribbean have never been extensive, but the Koreans did take 8.1 t of swordfish during 1978. No catches have been reported since 1986 (Anguilla, appendix D).

Martinique: Dominica and France (for Martinique) agreed on the delimitation of their common marine border in 1986 after 4 years of negotiations.[155] Large numbers of Martinique artisanal fishermen operate off Dominica. Some are licensed under the terms of a reciprocal agreement negotiated by the EU. Dominican fishermen complain that French fishermen with larger boats and better capabilities heavily fish the Macuba Bank located between the two islands.[156]

Spain: Spain operates one of the largest Atlantic longline fisheries. The authors, however, know of no Spanish fishing off Dominica.[157] Spanish fishermen do not operate in the Wider-Caribbean (Caribbean Overview, appendix D6). This includes the northeastern Caribbean (Anguilla, appendix D).

Taiwan: Taiwan, like the Japanese, initiated Caribbean-area longline operations in the 1960s. The primary Taiwan activity has been to the north of the Caribbean, as far as Bermuda, where they have targeted albacore to supply Puerto Rican canneries packing "white meat" tuna.[158] Many of the vessels have operated out of St. Maartens.[159] Available evidence suggests that Taiwan longliners are not

extensively fishing Caribbean waters, but do make opportunistic sets. They are also using Caribbean ports to transship their catch and maintain their fleet. Taiwan vessels in the mid-1980s began expanding transshipping activities out of Port-of-Spain.[160] The vessels, however, do not appear to be the longliners targeting albacore to the north of the Caribbean. Unconfirmed reports suggest that Taiwan vessels based in St. Maarten's are fishing off Dominica.[161] The Taiwan fishermen, however, do not appear to be very active in the Caribbean itself. They have been known to set opportunistically in waters adjacent to the northeastern Caribbean islands near their transhipment point at St. Maartens. Taiwan operations are highly seasonal and vary greatly from year to year (Anguilla, Appendix D). They are most active in the second quarter of the year and to a lesser extent the third quarter.[162]

United States: The United States began developing a longline fleet targeting yellowfin tuna in the Gulf of Mexico. U.S. longline fishermen began targeting swordfish in the mid-1980s after commercial stocks were encountered off the Florida Atlantic coast.[163] A small number of the swordfish/tuna U.S. longliners are active in the wider-Caribbean, including grounds to the north and east of Puerto Rico. The U.S. fishery is highly seasonal, primarily conducted during the winter months. U.S. pelagic longline fishermen in the Caribbean often fish in the northeastern Caribbean, but generally to the west of Dominica (figure 4).[164]

B. Joint ventures

The authors know of no joint ventures dealing with swordfish, tuna, or other large pelagics.

C. Foreign aid

The principal donor providing fisheries assistance to Dominica is Japan.

Canada: Canada donated an 8-m patrol boat to Dominica in 1981 to enable the island to provide coast guard services. The fiberglass boat was built on St. Vincent.[165]

Caribbean Development Bank (CDB): The CDB in 1981 was considering a fisheries project to improve landing sites in Dominica to be financed from its $2.2 million International Fund for Agricultural Development. CDB officials visited Marigot, Calibishe, Scotts Head, and Point Michel.[166]

European Union (EU): The 1993 reciprocal fisheries agreement between Dominica and the EU obligated the EU to provide financial compensation totaling ECU 1.65 million and an ongoing payment of $0.4 million to financing a fisheries science program focusing on shared stocks.[167]

FAO: FAO financed a small project in 1984-85 to assess the feasibility of building artificial reefs. Dominica has only a narrow island shelf and a limited coral reef ecosystem. Local officials were hopeful that an artificial reef could help increase catches and lower operating costs by allowing the fishermen to operate on conveniently located areas. The FAO has also provided technical assistance in constructing FADs from local materials to increase pelagic catches, especially tuna and dorado.[168]

Japan: The Japanese Government has funded several fishery related programs in the Eastern Caribbean, including Dominica, Grenada, St. Lucia, and St. Vincent and the Grenadines. The major project on Dominica has been the $23 million port complex at Rosseau. Japanese officials have been relatively candid in private conversations that they fund these projects as a way to influence votes in

Photo 11.--Taiwan Masterfisherman Hon Juey Tso is seen here aboard the "Silver Dolphin" working with Dominican fishermen. Riviere Sebastian

international fora for the Japanese position on whaling and fisheries. Dominica officials, however, have denied published reports that assistance received from Japan has affected their positions on fisheries and whaling in international fora.[169]

Organization of American States (OAS): The OAS funded a project which was initiated in December 1983 to assist Dominica collect basic statistical data.[170]

Taiwan: A Taiwan longline fishing training program began in 1986. The Taiwan government paid a Taiwan masterfisherman to work with the local fishermen. The program continued for 10 years, working with the island's artisanal fishermen. The Taiwan masterfisherman showed the fishermen that tuna could be caught year round. This has helped convert the tuna fishery into a year round activity. Taiwan donated a longliner, the *Silver Dolphin*, which has been used for training. An average of 55-60 fishermen were trained annually on 4-6 day cruises. The fishermen were previously used to day trips for operations in coastal waters. Fishermen had been taking tuna mostly from July to December. The Taiwan masterfishermen showed them that tuna made vertical migrations and were actually available off Dominica year round, only in deeper waters during the January to July off-season. The project helped to popularize artisanal longlines in Dominica.[171] The master fishermen also worked with the artisanal fishermen operating small boats. He suggested they depart early so they could set their line before dawn. Some have modified their methods by setting their lines earlier in the morning. The Taiwan masterfishermen moved to Martinique in July 1996 to work with a fisheries development project which acquired a 9-m longliner, the *Caribbean Flag*. Because of the relationship between Martinique, Dominica, and St. Lucia, longline training is being offered to fishermen on all three islands.[172]

United Kingdom: The U.K. provided a fisheries officer during the early 1970s. The U.K. also purchased a used vessel, the *Pilgrim*, for training and test fishing. The adviser apparently accomplished little and the vessel was allowed to deteriorate when the U.K. fisheries adviser left. Another U.K. financed project conducted trials on offshore banks during 1977, but with little success.[173]

United Nations (UN): The UN World Food Programme funded improvements at 10 landing sites in 1989.[174]

United States: The United States provided about $0.3 million in assistance to help rebuild the artisanal fishing fleet after a hurricane in 1979.[175] Dominican officials indicate that the $1.0 million in low-interest loans available to the fishermen through the U.S. credit facility were extremely helpful in enabling the industry to recover.[176] The United States has also provided a Coast Guard patrol vessel.

XVII. Enforcement

Canada donated an 8-m patrol boat to Dominica in 1981.[177] Dominica participates in the OECS joint enforcement initiative. Enforcement is, however, essentially carried out by Dominican authorities, especially as Guadeloupe and Martinique separate Dominica from the rest of the OECS countries. Dominica has a unique problem within the OECS because it does not share a common fisheries surveillance zone with the other OECS countries. It is instead sandwiched between the French islands of Martinique and Guadeloupe. Some of the best grounds, like the Macuba Bank, are heavily fished by fishermen from Martinique. Guadeloupe fishermen also fish off Dominica. Dominica grants licenses to Guadeloupe and Martinique fishermen, but not all of the fishermen from these islands are licensed.

The authors have few details on actual incidents noted around Dominica.

Martinique: The French have more at sea patrol capability than the Dominicans. While most of the illegal fishing is Martinique fishermen operating off Dominica, some Dominican fishermen occasionally operate off Martinique. In 1993, a Dominican fishermen reported being fired on by a French coast guard cutter.[178]

United States: The Dominicans are known to have seized the U.S. longliner *Bobby Gale III*, home ported in Georgetown, South Carolina, on May 20, 1987. At the time of the seizure, the U.S. longliner had 4.3 t of fish, including swordfish (2.7 t), tuna (0.7 t), and marlin (0.5 t). The vessel was seized about 62 km west of Dominica in the Caribbean. Citizens of Montserrat and St. Kitts-Nevis comprised the crew. Dominican law provided for only small fines so the judge confiscated the catch, but released the crew and vessel.[179]

XVIII. Future Trends

Dominican officials have expressed an interest in the pelagic longline fishery. They have primarily been interested in tunas, although swordfish catches have been reported. Training programs have introduced longlining to the local fishermen. The relatively small size of the Dominican EEZ and separation from the rest of the OECS by the two French islands to the north and south presents a challenge to the development of a commercial fishery for large pelagics.

Dominican artisanal fishermen conduct limited longline operations. Only a few fishermen longline full-time, but a larger number fish part-time. Officials report that the cost of longline gear has made it difficult for the fishermen to initiate such operations. The small number of existing boats are another problem. The limited number of younger fishermen active in the fishery probably is a factor restricting the number of fishermen interested in launching a new fishery. Despite these limitations, some fishermen would like to upgrade their boats to modern fiberglass pirogues that could accommodate a small longline, but can not afford to do so. A few artisanal fishermen conduct small-scale longlining, but even this was interrupted when their vessels were damaged or destroyed by Hurricane Lenny in 1999 which also badly damaged the country's limited port infrastructure. The artisanal fishermen may be able to expand operations, but based on their experience in the late 1990s, only a small number of fishermen will be involved.

A few commercial ventures have been attempted. Two commercial longliners were deployed in the late 1990s, but results were disappointing and the vessel owners have since deployed their vessels elsewhere. The AID-Bank which financed them has been unable to repossess the vessels and faces a substantial loss. The failure of two longliners financed by the AID-Bank was a major setback. The Bank will probably hesitant to finance additional longliners in the near future. Some limited commercial longlining continues in 2000 with two small longliners. Some fishermen are convinced that commercial longlining is feasible. The FD reports that five applications for new longliners were pending in 2000. It is unknown how likely these ventures are to actually obtain funding.

Two especially interesting developments have been noted on Dominica in recent years. First, the FADs deployed by the fishermen have reportedly been of some assistance in increasing catches. They are inexpensive FADs built and deployed by the fishermen. The new fishery complexes the Japanese are funding could help expand domestic demand for seafood which could help build a stronger domestic market for Dominican longline fishermen.

Dominican artisanal fishermen will probably expand the current limited longline operations. The artisanal fishermen, however, have reported substantial increases in pelagic catches during the 1990s (appendix B2). The profitability of commercial operations from Dominica, however, has not yet been demonstrated. Funding for such operations may prove especially difficult given the failure of the AID-Bank loans. Some small-scale commercial longline operations may be initiated. Further modest catch increases are possible, especially when the damage caused by Hurricane Lenny is repaired. Increased artisanal catches of tuna and wahoo are most likely. It seems unlikely that Dominica will initiate significant commercial longline operations in the foreseeable future. There is no indication that the Dominicans in the next few years are acquiring the boats and gear needed to target swordfish.

* * * *

Note: This chapter was designed and formatted by Ms. Erica Carter, a senior at Walter Johnson High School in Bethesda, Maryland. Ms. Carter worked with the National Fisheries Service as part of the High School/High Tech program. She is planning to begin college in 2001 and pursue a career in law, psychology, or art therapy.

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SECTION I. (Overview)

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Appendices

Series A: Fleet
Series B: Catch
Series C: Trade
Series D: Seabirds

Appendix A.--Dominica. Longline fleet, 1999-2000

Vessel	Owner	Port	Size		Hold	Hull	Crew	Origin	Notes
			Length	Width					
			Meters		Tons		Individuals		
Caribbean Flag	MRCP**	Various	9	4	NA***	GRP	5-6#	Martinique	Training artisanal fishermen in 1999-2000*
Kate	NA	Rosseau	9						Active from 1992 to date
Maverick	AID-Bank##	Port-of-Spain							Not active in Dominica during 2000
Nature Island	AID-Bank##	Unknown							Not active in Dominica during 2000
Silver Dolphin									Japanese donated training vessel####
Silver Star	NA****	Portsmouth###	16	NA	NA	NA	NA	United States	Active in Dominica during 1999-2000

NA - NOt avaialble
* The St. Lucian training session began March 1999
** Martinique Regional Council Project
*** Three holds totaling 4.8 cubic meters.
**** The *Silver Star* was co-owned by a Dominican and Antiguan until 1998 when the Dominican purchased the Antiguan share.
# Training sessions
The AID-Bank is attempt to repossesses these two vessels.
The *Silver Star* was operated out of St. John's (Antigua) in the mid 1990s, but was returned to Dominica in 1998.
The *Silver Dophin* in 2000 was being used as a cargo vessel.
Source: Vessel owners

Appendix B1.--Dominica. Fisheries catch, 1980-99

Year	Catch	
	FAO	Other
	Metric tons	
1980	1,445	
1981	1,514	
1982	1,545	
1983	1,000F	
1984	500F	
1985	446	
1986	450	
1987	500F	291*
1988	500F	165*
1989	500F	
1990	448	
1991	552	
1992	711	
1993	794	
1994	882	
1995	838	
1996	900	
1997	1,000	
1998	1,212	
1999	1,200F	

F - FAO estimate
* Fisheries Department as reported in U.S. Embassy, Bridgetown, "Conservation of sea turtles: Dominica," message number 633, January 26, 1990.
Source: FAO, *Yearbook of Fishery Statistics*, (FAO: Rome, various years).

Appendix B2.--Dominica. Oceanic pelagic catch, 1988-94

Species	Year									
	1988	1989	1990	1991	1992	1993	1994	1995	1996-98	1999
	Metric tons									
Tunas										
Yellowfin	3.2	6.5	18.0	11.7	22.6	30.0	31.0	9.0	NA	80.0
Skipjack*	4.5	15.2	60.0	37.8	41.1	23.6	43.0	33.0	NA	85.0
Blackfin	1.1	4.1	18.7	9.7	13.9	14.8	19.0	30.0	NA	79.0
Wahoo	0.9	2.5	5.8	9.3	12.5	6.9	59.0**	58.0	58.0	50.0
King mackerel	20.0	29.0	32.5	33.5	46.6	51.7	NA	-	NA	36.0
Total	29.7	57.3	135.0	102.0	136.7	127.2	152.0	130.0	NA	330.0

NA - Not available
* Skipjack landings include small tunas such as frigate tuna (*Auxis thazard*) and bullet tuna (*A. rochei*).
** Reported wahoo (*Acanthocybium solandri*) catches are combined with king mackerel (*Scomberomorus cavalla*).
Source: Pelagic and Reef Fishes Resource Assessment Unit, "Report of the CARICOM Fisheries Resource Assessment and Management Program (CFRAMP)," *ICCAT Collective Volumes of Scientific Papers*, SCRS/94/128, pp. 262-265 and 1995 update, in press and FAO *Yearbook of Fishery Statistics*, 1999 (1995-99 data).

Appendix C1.--Dominica. Swordfish exports by destination, 1991-99

Destination	Year									
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
	Metric tons									
United States	-	-	-	-	-	-	-	-	-	-
Japan	-	-	-	-	-	-	-	-	-	NA
European Union	NA	-	-	-	-	-	-	-	-	NA
Others**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total	-	-	-	-	-					

** Swordfish shipments to other countries are believed to be non-existent or negligible
Source: Various

Appendix C2.--United States. Fishery imports from Dominica, 1990-June 2001

Year	Quantity	Value	Commodity
	Metric tons	US$1,000	
1990	-	-	
1991	-	-	
1992	-	-	
1993	-	-	
1994	16.5	87.0	Frozen shell-on shrimp
1995	-	-	
1996	0.9	4.5	Fresh yellowfin
1997	-	-	
1998	-	-	
1999	-	-	
2000	22.6	35.6	Seaweed and other algae
2001*	0.7	3.7	Seaweed and other algae

* Through June
Source: U.S. Bureau of the Census

Appendix D.--Dominica and Aves Island.# Seabird nesting, 1984

Area	Information	Species*	Known** threats	Importance***
Dominica	Poor	1??, 3?, 6, 16, 18, 19, 22	Ex?, ?	Important
Aves Island#	Reasonable	12, 18??, 19, 22	Ex, Ha	Extremely important

Venezuelan jurisdiction. The authors only recebtly found this source and were unable to include it in the Venezuelan chapter. We are including it here as Aves is close to Dominica.
* Species: 1 - Pterodroma h. hasitata; 3 - Puffinus I. lherminieri; 6 - P. lepturus; 12 - Larus atricilla; 16 - S. dougallii; 18 - S. anaethetus; 19 - S. fuscata; 22 - A. stolidus
** Threats: Ex - exploitation of eggs, young or adults; Pr - predators, generally introduced mammals; Ha - habitat destruction or disturbances; Po - pollution; Fi - fisheries
*** A rough subjective rating of relative importance of area for breeding seabirds.
Source: Ruud van Halewyn and Robert L. Norton, "The status and conservation of seabirds in the Caribbean," in J.P. Croxall, P.G.H. Evans, and R.W. Schreiber (eds.), "Status and conservation of the world's seabirds," *ICBP Technical Publication*, No. 2 (ICBP: Cambridge, 1984), pp. 175-176.

10

DOMINICAN REPUBLIC

The Dominican Republic has a very small fishing industry. The catch is primarily taken by artisanal fishermen using small boats. The overall fisheries catch is quite limited. Most of it is consumed domestically and exports are limited. There are however, substantial seafood imports--mostly cured and canned product. The fishermen primarily take demersal species. The fishermen use a variety of gear, including handlines and gillnets. Some demersal longlining is reported by the artisanal fishermen, but the authors know of no pelagic longlining. They also report a small tuna and billfish catch, but no swordfish. Dominican officials report a substantial catch of bluefin tuna, but this may be the result of inaccurate species identification. They authors know of no Dominican commercial longline vessels. In fact, there are few commercial fishing vessels of any type. There is no indication at this time that Dominican fishermen are planning to acquire commercial longliners and enter the longline fishery for swordfish or other oceanic pelagics. Neighboring countries and the Dominican Republic report at sea fishery incidents, but these mostly involve artisanal fishermen. The authors know of no longline seizures.

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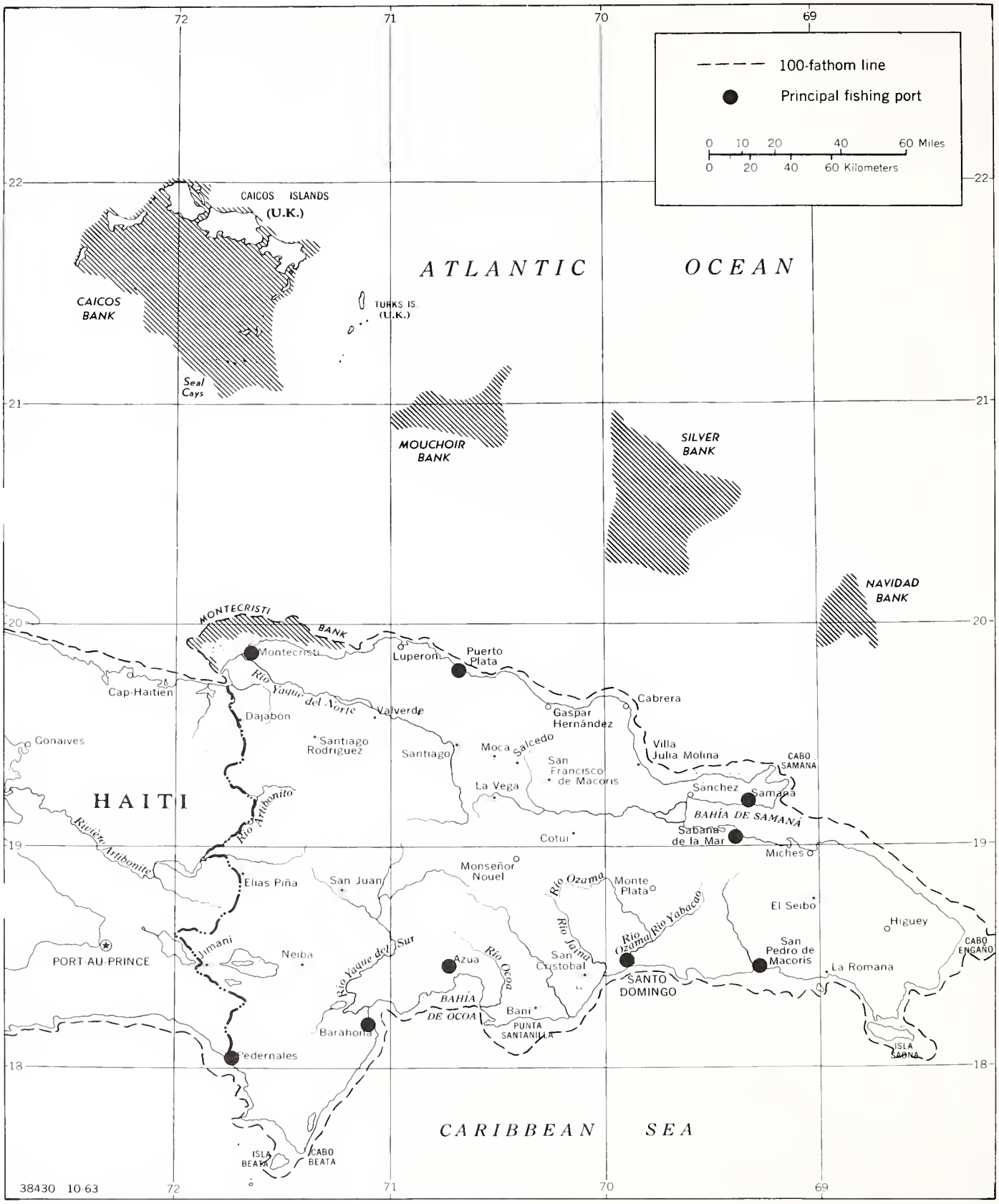

Figure 1.--Map of the Dominican Republic

I. Overview

A. Background

Columbus discovered the island of Hispaniola in 1493. The Dominican Republic now comprises the eastern two-thirds of the island. The capital of Santo Domingo was founded by Columbus' brother Bartholome in 1496 and is the oldest colonial-era city in the Americas. The French colonized the western part of the island which is now Haiti. Spain ceded the colony of Santo Domingo to France in 1795. The Dominican population, however, resisted French rule and defeated a French army in 1808. With the assistance of the British Navy, the Dominicans forced the French to relinquish control to the Spanish Crown. The Dominicans declared independence from Spain in 1821, but were invaded and occupied by Haitian forces in 1822. The Dominicans expelled the Haitians in 1844 and founded the Dominican Republic in the same year.

B. Fishing industry

The Dominican Republic has a very small fishing industry, largely conducted by artisanal fishermen.[1] Unlike many other Caribbean islands, the Dominican Republic produces much of its basic food supply as well as considerable for export. The fishing industry, however, makes only a minor contribution to food production--although it supplies most of the domestic demand. Dominican economic statistics indicate that the fishing industry contributes only a fraction of 1 percent of the national gross domestic product. The prospects for a commercial fishing industry seem limited by the relative scarcity of marketable species in coastal waters.

The island of Hispaniola is the second largest in the Caribbean, so there is some freshwater fishing, but most of the Dominican catch is marine. The catch is primarily taken by artisanal fishermen from small wooden boats operating along the coast. The average artisanal boat is about 3-7 meters (m). The artisanal craft are yawls, canoes, and boats built locally of wood. An increasing number of fiberglass boats have appeared in recent years and most artisanal boats now have outboard motors. Dominican fishermen also operate a few larger boats, varying from 7-22 m which are deployed in off-shore fisheries on the Plata (Silver) and Navidad Banks. Artisanal fishermen primarily use handlines and gillnets and, to a lesser extent, beach seines, longlines, and cast nets. The fishermen on the offshore banks operate from mother ships and harvest marine species by spear fishing. The mother ships may tow as many as 20 yawls.

Fishermen land their catch at more than 70 locations, most are simple beach sites without even basic processing facilities. Catches have declined notably in recent years. The catch which once exceeded 20,000 metric tons (t) was less than 9,000 t in 1999 (appendix A). The Dominican catch tends to vary substantially from year to year, but in 1999 there has been a notable decline. Fishermen report a diverse catch. One of the largest fisheries is for snapper/grouper. Other species taken include grunt, tuna, and mackerel. Smaller quantities of shrimp, lobster, conch, and other shellfish are also taken. Most of the catch is consumed domestically.

Almost all of the Dominican Republic fisheries catch is consumed fresh in the domestic market. A few retail outlets freeze small quantities of fish, perhaps 10 percent of the catch. Fishery exports are minimal, generally less than $1 million annually (Caribbean Overview, appendix F1b). Small quantities are exported, usually less than $1.0 million, although shipments in 1997 totaled $1.8 million. The exports are mainly high value species like conch and snapper. Most of the exports are shipped to the United States.

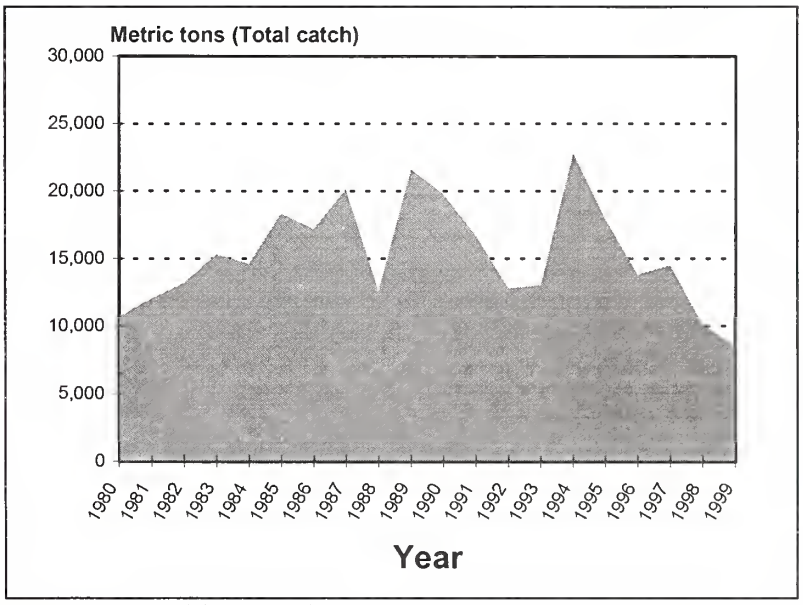

Figure 2.--The Dominican Republic fisheries catch has fluctuated in recent years, but the 1999 catch fell to extremely low levels.

While exports are limited, the Dominican Republic imports substantial quantities of seafood, usually more than $25 million annually. Imports in 1997 totaled $47 million and appears to have exceeded $50 million in 1998 and 1999 (Caribbean Overview, appendix F1a). Most of the imports are cured fish used to prepare traditional foods and to a lesser extent canned fish.

Limited foreign fishing occurs off the Dominican Republic, but no data is available. There appears to be few prospects for distant-water countries to deploy any significant number of vessels in Dominican waters. Dominican fishermen do not conduct distant-water operations, although there are occasional incidents with neighboring countries. The country is one of several Caribbean countries, however, where foreign vessel owners have obtained flag-of-convenience registrations. Foreign vessel owners appear to have registered relatively few vessels in the Dominican Republic, but inadequate information is available.

II. Species

The authors know of no studies describing swordfish off the Dominican Republic. Some limited data is available from foreign researchers or other sources from neighboring islands.

A. Spawning

The spawning grounds for swordfish are primarily deduced by the location and abundance of swordfish larvae. One 1983 study reported that there is relatively little spawning within the Caribbean itself, although some limited spawning does take place south of Cuba. Considerable spawning activity is reported off western Cuba, both in the Yucatan and Florida straights (Cuba, figure 4). Most of it occurs north of western Cuba in the Gulf of Mexico. Significant concentrations of small larvae have been found there. Notably this is an area from which larval swordfish can be transported by the Gulf Stream into the western Gulf and Mexico and north along the U.S. eastern coast to Cape Hatteras, the northern limit for significant concentrations of larval swordfish. The larger larvae found off Hatteras may well be from fish spawning off western Cuba. Larvae are present throughout the year in the western Caribbean and Gulf of Mexico, but most prevalent in the late fall and winter. Some larvae have also been found in the Windward passage between Cuba and Haiti, but to a lesser extent in the Mona Channel between the Dominican Republic and Puerto Rico. Larvae have been reported to the north and northeast of the Dominican Republic, but not to the south.[2] A 1998 analysis shows a similar pattern of larval concentrations in the Gulf of Mexico and U.S. southeastern coast, but no concentrations of larvae either north or south of the Dominican Republic (Venezuela, figure 10).[3]

B. Migrations

Little information is available on swordfish migratory movement off the Dominican Republic. Almost no tag returns have been reported near the Dominican Republic. This is in part because there is little fishing for swordfish in the Mona Passage between the Dominican Republic and Puerto Rico, in contrast to the more extensive fishing in the Windward Passage between Cuba and Haiti (figure 10).[4] The authors know of only one swordfish tag return noted near the Dominican Republic (R167301) (Caribbean Overview, appendix C). The fish was tagged west of St. Vincent and recovered south of the Dominican Republic (figure 3). This seems to suggest a westerly movement of swordfish within the Caribbean basin.

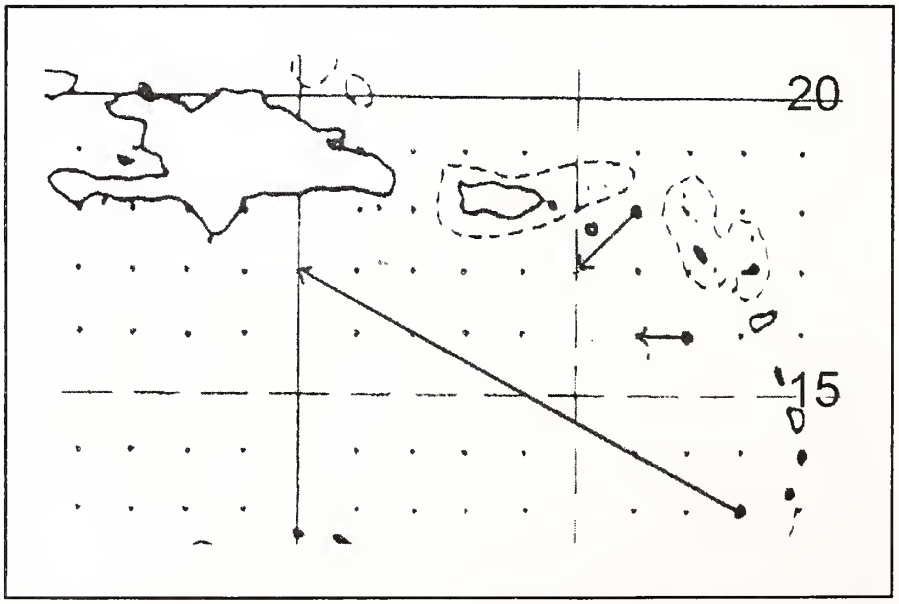

Figure 3.--Only one tagged swordfish has been retrieved near the Dominican Republic. As it was at large more than 5 years, it is difficult to assess its movements.

The fish, however, was at large for over 5 years so there are a variety of different scenarios about its movement. It was fairly small when tagged, only 4.5 kg and only 29.5 kg when taken so it could have been a resident fish in the eastern Caribbean for that period. It could also have migrated north along the Gulf Stream and returned or made a full circuit around the North atlantic Gyre. Until swordfish are tagged with the new archival tags it will not be possible to determine migratory movement more precisely. Although not tagged or retrieved off the Dominican Republic, a fish tagged northeast of Anguilla was taken in the Windward Passage, suggesting a westerly movement along the Antillian Current along the northern coast (Haiti, figure 3).

C. Seasonality

Dominican fishermen do not take swordfish. They do, however, report a highly seasonal pelagic fishery for tunas and mackerels. The best catches are taken from March to June and sometimes toward the end of the year.[5]

III. Fishing Grounds

The Dominican Republic has a larger expanse of shallow shelf than many other Caribbean islands, but only because it is a larger island. The shelf at most locations along the 1,060 km is quite narrow, usually less than 7 kilometers. Dominican officials divide the coast into three regions, a northern, eastern, and southern zone. The shelf is especially narrow along the northern coast. The narrow shelf significantly limits the potential demersal resources. Some larger shelf areas exist around Montecristi (northern coast), Pedernales (southern coast), and Cabo Engaño and Higuey (eastern coast). The coastal areas are similar in all three areas, being composed of mixed bottoms of rocky and sandy areas without important topographical features. The only major exceptions are the Peninsula and Bay of Samaná. The Bay of Samaná is one of the few locations along the coast where there is notable sedimentation.[6]

One of the most distinctive feature of the Dominican coast is the steep descent from the narrow shelf to quite deep waters. This is especially the case off the northern coast. Off Samaná, for example, water 3,000 m deep can be reached just 5 km off the coast.

The Dominican Republic has fringing reefs and small barrier reefs scattered along less than 170 km of the coast. There are also some offshore bank reefs. Many coastal reefs are believed to be in fairly poor condition, and may have been damaged by increases in sediments due to inadequate land management. A variety of problems are noted, including upland deforestation, estuarine wetland development, soil erosion, and coastal construction. Another problem is excessive nutrient flows from agricultural fertilizers as well as urban sewage. The pesticides used in agricultural are another concern. Given the Dominican Republic's important agricultural industry, the agricultural runoff is potentially serious. Coral reefs have suffered from the growth of large, fleshy algae at several localities, including an underwater park (La Caleta). Coral reefs have notably declined near coastal cities where sewage pollution is a major concern (Santo Domingo and Haina). There has also been damage from small-scale breakage of corals by snorkellers and SCUBA divers at numerous dive sites, particularly near the most popular tourist centers on the north and east coasts. The Dominican Government is making an effort attempting to protect its coral reefs. Approximately 20 percent of the coral reefs in the Dominican Republic occur within marine parks and sanctuaries. One report indicates that artisanal fishing has declined in coastal waters during the last decade, and reef fish populations are increasing. Nevertheless, queen conch, spiny lobster, groupers, snappers, and grunts as well as aquarium reef fish, black corals, hermit crabs, and "live rock" are still intensively harvested (both in and out of legal seasons) in some areas.[7]

A large peninsula along the northern coast creates the Samaná Bay, the largest bay in the wider-Caribbean. The Bay is one of the most important Dominican fishing grounds and much of the country's small shrimp catch is taken there. Artisanal fishermen also report substantial catches in the Bay.[8] Samaná Bay is also an important natural reserve with two protected areas: the Hitises National Park and the Natural Scientific Reserve of Lagunas Redonda y Limón. About 1,000 humpback whales appear in the Bay annually.[9] A marine mammal sanctuary was created in 1986.[10]

There are also two important offshore banks to the north of the island, Silver and Navidad Banks. These Banks are some of the principal fishing grounds utilized by Dominican fishermen. A third offshore bank, Mouchoir (Pañuelo Blanco), is also located to the north of the island, but outside the Dominican Exclusive Economic Zone (EEZ). Northeast of the island can be found the extremely deep water of the

Puerto Rican Trench. Separating the Dominican Republic and Puerto Rico is the Mona Passage, an important connection between the Atlantic and Caribbean. Unlike some of the other passages, such as the Windward Passage between Cuba and Haiti, relatively little longline activity is reported in the Mona Passage. Some Dominican fishermen occasionally stray into the EEZs of neighboring islands and there are scattered incidents involving there fishermen. Dominican fishermen do not conduct distant-water fisheries.

Dominican fishermen report pelagic catches on several different grounds. One of the favored pelagic grounds is along the eastern coast around the Boca de Yuma. This is also a popular area for the recreational boats. Pelagic species are also fished on other grounds along the southern and northern coasts.[11]

IV. Fleet

Dominican officials report that their fishery is essentially artisanal using small boats. Only a few commercial vessels are operated by Dominican fishermen.[12]

A. Artisanal

The authors have noted various estimates of the number of artisanal craft. Artisanal fishermen in the late 1970s operated about 1,400 locally constructed craft, including canoes (420), yawls (830), and boats (150).[13] A report prepared in 1980s estimated that there were about 2,400 artisanal boats active: canoes (996), undecked yawls (1,154), and decked boats (168) (appendix A).[14] Another source in the 1980s estimated about 4,000 small boats were active.[15] The authors were unable to obtain a current estimate on the number of active artisanal craft. It is probable that the number of dugout canoes has declined and that fiberglass boats, virtually all with outboard motors, now play a more important role.

The characteristics of the artisanal craft are as follows. The relative importance of the different types of artisanal craft varied substantially at different locations around the coast (figure 4).

Canoes: Cayucos or dugout canoes were often built by the fishermen themselves and were the most rudimentary craft deployed. Most were about 3.5-4.0 m long. They could only be used on inshore grounds, no more than 3-6 km from the coast. Cayucos were mostly used in sheltered waters of Samaná Bay and around Puerto Plata.

Yawls: Yolas or yawls were the most common craft deployed by the artisanal fishermen, but are now becoming less important. They are undecked, flat-bottom boats, ranging from 4-6 m in length. Most of them were equipped with outboard motors. They can only be used along the coast, like the cayucos no more than 3-6 km from shore. Yolas were most common off the southern coast.

Boats: Botes or boats are decked craft, most of which ranged from 7-15 m, a few were as large as 18-20 meters. They were built by local shipwrights. These boats were capable of fishing offshore.[16]

Other: The Inter-American Development Bank (IDB) in the 1970s helped finance the importation of 2 steel shrimp trawlers and 64 fiberglass boats ranging from 8.7-21.6 m, primarily for hook and line fisheries.[17]

Motherships: Dominican officials also report deploying small boats from motherships

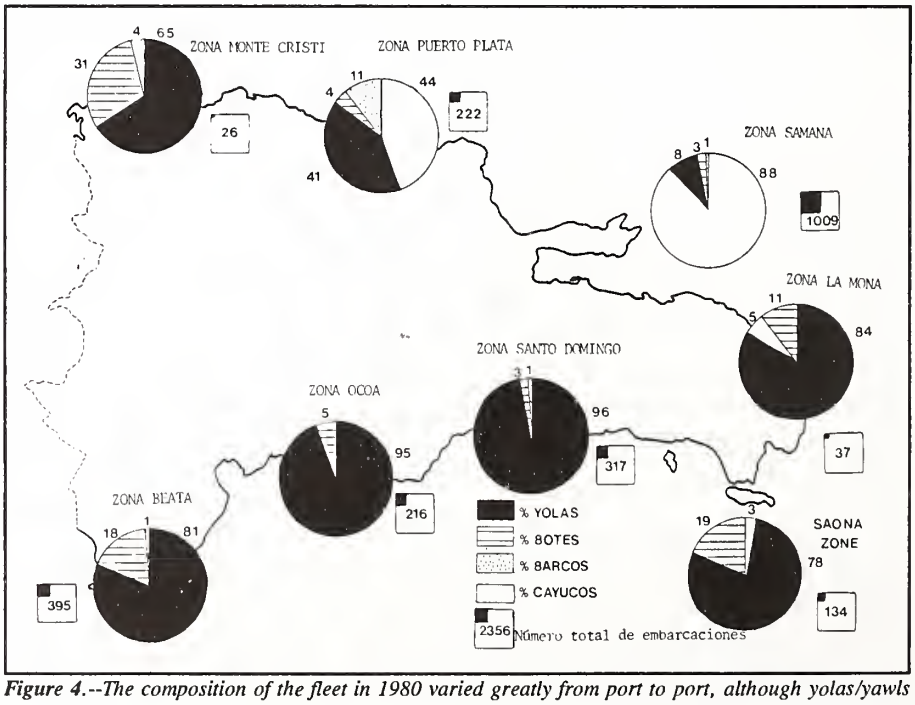

Figure 4.--The composition of the fleet in 1980 varied greatly from port to port, although yolas/yawls were the most important vessel type except in Samaná Bay where many cayucos operated. FDL

("embarcaciones nodrizas"). Divers fish from the small boats (5.0-6.5 m) which are equipped with air compressors.[18]

B. Commercial

Commercial fishermen deploy a few trawlers. The authors know of no large fishing vessels (over 500 GRT) registered in the Dominican Republic. Neither Lloyd's or FAO reports any such vessels in the Dominican fleet.[19] The U.S. Office of Naval Intelligence does report two U.S.-built 198-GRT trawlers registered in the country. The authors know of no pelagic longliners and Dominican officials confirm that there are no longliners.[20]

C. Flag-of-convenience

The Dominican Republic makes some flag-of-convenience registration for foreign-owned fishing vessels. The Dominican Republic, however, does not appear to have a large program of registering these. The authors have not noted any appreciable number of Dominican flag-of-convenience longliners.[21] Only a few foreign vessel owners appear to have obtained flag-of-convenience registrations in the Dominican Republic. Little information is available on where the flag-of-convenience vessels operate. Only a few press reports have been noted. A Dominican-registered vessel owned by Faroese interests was reported fishing in an area of the Barents Sea that falls outside the 200-mile EEZs of both Norway and Russia during 1993.[22] The vessel owners are not reporting their harvest as part of the Dominican catch.

V. Shipyards

The Dominican Republic has no specialized domestic shipyards capable of building longliners. The country imports the small number of commercial fishing vessels deployed in the fishery. Some fishermen have made their own canoes, but this is becoming less common. Artisanal-scale yards and shipwrights produce the small and medium sized artisanal boats. A few small yards such as PROFISA produce fiberglass boats.[23] There are no specific legal provisions governing the importation of new or used fishing vessels.[24]

VI. Fleet Operations and Gear

A. Commercial

The principal commercial fishery is for shrimp which is conducted in Samaná Bay along the northern coast. The authors know of no commercial longline fishery targeting swordfish or billfish. Other sources report that there are no known longliners operating in the Dominican Republic.[25]

B. Artisanal

The Dominican Republic has about 9,000 artisanal fishermen who primarily target reef fish and to a lesser extent pelagic species. Normal operations are to depart in the afternoon at about 4:00-5:00 pm and return the following morning between 5:00-8:00 am. Small catches are sold locally, larger catches are usually sold to a broker or intermediary. Some fishermen work from motherships who stay on the fishing grounds for several days. These motherships operate on offshore banks, including Navidad, Plata (Sliver), Pañuelo Blanco (Mouchoir), Caicos, and Gran Bahamas.[26] Fishing operations include diving fisheries on the offshore Navidad and Plata Bank.[27] Only Navidad and Plata are, however, within the Dominican EEZ.

Dominican fishermen have used a variety of fishing gear. The authors do have information on the gear currently being deployed by the fishermen:
Hand line: Simple hand line ("cordel") fishing is the most common method traditionally used by the artisanal fishermen from canoes and yawls. They fished in water from 15-450 m deep for snappers, groupers, and

Photo 1.--This a typical fish pot made by Dominican fishermen with local materials.

other reef fish.

Troll: Fishermen may deploy troll lines ("curricánes") when moving between fishing grounds. The catch is often king or Spanish mackerel and bonito.

Traps: Fishermen also deployed wire traps ("nasas") from canoes and yawls for lobster and finfish. The lobster traps were commonly set at depths of 15-45 m while traps for grouper and other fin fish were set 240-300 meters.

Longlines: Artisanal fishermen set bottom longlines, normally with 50-100 hooks at depths of 30-60 meters. One source suggests that some had up to 500 hooks. Some bottom longlines were also set for shark.[28] The authors know of no pelagic longlining.[29]

Nets: A variety of nets including gillnets ("agallera") were used for sharks. There were also nets ("curricán") for pelagic species like dorado and bonito. Small hand nets ("atarraya") were used for bait and shrimp in the Samaná Bay.

Beachseines: Beaches seines ("chinchorro de playa") were most commonly used in Samaná Bay. The catch consisted of a variety of species, including mackerel, bonito, sierra, snook, and others.

Light attraction: Light attraction was practiced with both lines and nets for squid and various fin fish.[30]

Diving: Diving along the coast with harpoons is primarily recreational. Offshore motherships deploy small boats. Artisanal fishermen from those small boats dive with harpoons.[31]

The artisanal fishermen conducting pelagic fisheries report occasional billfish catches (blue and white marlin and sailfish). There is no reported swordfish catch although a few may be occasionally taken by the artisanal fishermen. The tuna fishery is very small. Fishermen report an unusual mix of tuna species: skipjack, blackfin, and the extremely valuable bluefin tuna. The authors are not sure, however, if the relatively large bluefin catches reported are accurate.

FAO technical advisers in the 1970s recommended that Dominican fishermen initiate a variety of new fisheries. One of these was pelagic longlining.[32] The authors know, however, of no actual effort to introduce pelagic longlining in the Dominican Republic.

C. Recreational

The Dominican Republic has only a small recreational fishery, but it is a tourist attraction of some importance. The industry appears to focus more on diving than sport fishing.[33] Marlin and wahoo tend to be the most sought-after species, but tuna, dorado, and makos are also taken. One company reports that the best catches are normally reported in the first half of the year.[34] Another outdoor enthusiast says that July and August are good months for blue marlin and that good tuna catches are also taken then.[35]

One tournament is conducted by the International Light Tackle Association. It is a very long running tournament. The 59th annual tournament was held May 31-June 5, 1999 at Cabeza de Toro.[36] Organizers of the Bahamian Barta Blue Marlin classic have arranged for a second leg of their Bahamian tournament in 1999 to be held at Punta Cana on the eastern tip of the island, May 25-28.[37] The tournament was held again in 2000 at the Punta Cana resort. Organizers report that the tournament is one of a kind. All the catch is released, only dead bait is used, only single hooks can be used with no artificial teasers or lures, and there are no money prizes. The tournament was sold out with 64 participating boats within days of being advertised. The proceeds go to IGFA Junior Angler Program, the Punta Cana Orphanage, the hearing impaired kids of Guatemala, and the Puerto Rico Children's Hospital. The participants in 2000 reported hooking 70 billfish (49 white marlin, 15 blue marlin, and 6 sailfish).[38]

VII. Catch

The authors know of no Dominican swordfish catch. Dominican fishermen do report small catches of some other oceanic pelagics.

Tunas: The most notable aspect of the Dominican tuna catch is the relatively large catch of bluefin tuna that are reported (appendix B2). The Dominicans reported taking nearly 625 t in 1997. The authors have little information on the gear used to take tuna in the Dominican Republic. Dominican officials report that fishermen use line and troll gear to take bluefin.[39] The reported bluefin catch, however, may be an erroneous report with the species being misidentified. The authors can find no published reports confirming that Dominican fishermen are taking such large quantities of bluefin.[40] It is likely that the bluefin being reported to the FAO by Dominican officials is tuna that has been misidentified. The FAO report represents data submitted by Dominican officials.[41] Dominican officials assure the authors that they are actually taking bluefin and marketing it fresh in the domestic market.[42] The Dominicans also report small catches of skipjack and blackfin (appendix B2).

Dorado: Dominican dorado catches have varied from about 90-400 t during the 1990s. The 1999 catch was only about 175 t (appendix B3).

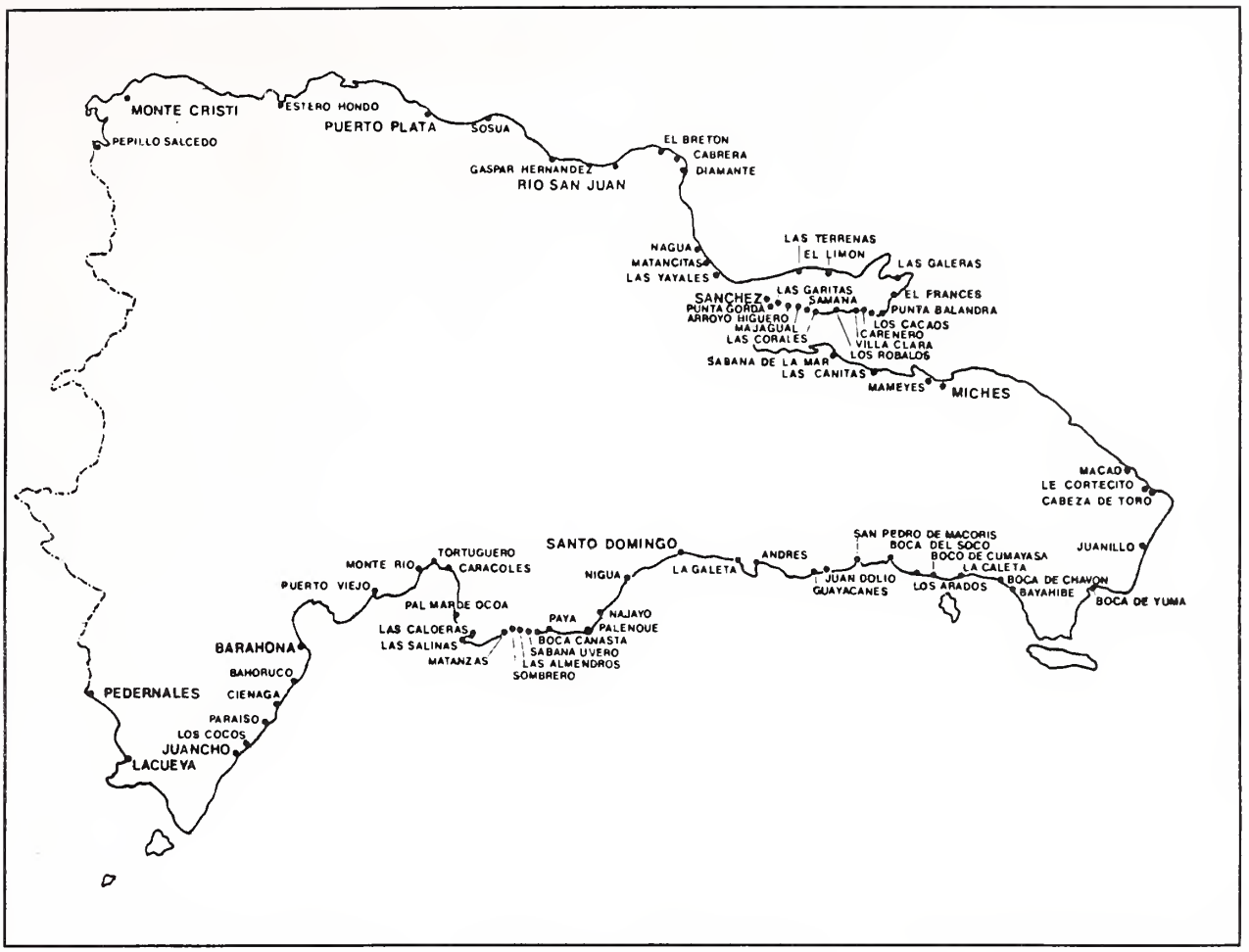

Figure 5.--Artisanal fishermen land their catch at a large number of sites all along the coast. FDL

Mackerels: Dominican fishermen also take small quantities of mackerel, both Spanish and cero. Spanish mackerel catches have exceeded 2,000 t, but totaled less than 200 t in 1998 and no catch was reported in 1999 (appendix B3). Such fluctuations are highly unusual and officials may be adjusting the statistical program.

Billfish: Available fishery statistics suggest that the only billfish taken in significant quantities is sailfish (appendices B4a-c). Data from the recreational fishery, however, suggests that white marlin is also being taken in considerable quantities and that blue marlin are present.[43]

VIII. Ports

Fish is landed at a large number of sites all along the Dominican coast. The most important landings are reported at Santo Domingo, Puerto Plata, Miches, Sánchez, San Souci, and Pedernales (figures 1, 4, and 5). The authors know of no ports where swordfish is being landed. The Dominican Government in 1985 signed a $25 million contract with domestic companies to set up a tuna processing complex, Dominicana de Atún, at the port of Manzanillo along the northern coast.[44] Sport fishing is available out of Santo Domingo, Puerto Plata, and La Romana.[45]

IX. Transshipments

Foreign fishermen do not transship their catches through Dominican ports.[46] There are no known swordfish transhipments through the Dominican Republic, although some swordfish does appear to have been transhipped in 1990 (appendix C2a). There may have also been some tuna transshipments during the 1990s (appendix C2c).

Some observers believe that Puerto Rican fishermen operating a few larger vessels may be transhipping some of their catch through foreign ports. Puerto Rican officials have very little information on

the operations of these larger vessels because they do not normally operate in Commonwealth waters. Officials believe that these multi-purpose vessels, some with longlines, operate on the highseas or off neighboring islands, especially the Dominican Republic. The officials speculate that these fishermen may be selling their catch in the Dominican Republic or other foreign countries. Officials report that product from these vessels rarely appears in Puerto Rican markets. The authors believe, however, that swordfish is rarely taken by these fishermen. They may be taking small quantities of billfish and tuna.[47] Officials on the Dominican Republic, however, do not believe this activity is taking place.[48]

X. Processing and Products

The authors know of no swordfish processing in the Dominican Republic. Artisanal fishermen reportedly sell juvenile billfish to a Santo Domingo taxidermy shop for sale to tourists.[49]

XI. Companies

The authors know of no Dominican companies handling swordfish. There are no large fishing companies in the Dominican Republic, but a few companies handle the catch of the few commercial trawlers and the mother boats operating on offshore banks. Many Dominican artisanal fishermen belong to cooperatives supported by the Institute for Cooperative Development and Credit (IDECOOP).

XII. Markets

A. Domestic

The Dominican Republic has two primary marketing channels. The fish landed by artisanal fishermen is trucked to Santo Domingo and other urban centers. Ice is available in most towns and villages. There are few wholesale marketing facilities. The fish landed by the offshore fleet is handled by a few fish marketing and exporting companies. Substantial quantities of fish landed by artisanal fishermen have been used for subsistence or sold locally while the major marketing channels have been central markets in urban centers. Much of the food sold in the Dominican Republic is sold in small shops ("colmados"or "pulperias").[50] These shops, however, usually only carry canned fish. In recent years, supermarkets have become increasingly important in the country and many do offer a variety of seafood products. The major supermarket chains are Nacional, Pola, Dominicano, and Asturias. Swordfish rarely appears in Dominican markets. There is no demand for the species and the public is unfamiliar with it. There is, however, a strong market for the tunas and mackerel taken by the pelagic fishermen.[51]

B. Trade

1. Exports

The Dominican Republic does not export swordfish. U.S. trade data show about 10 t of swordfish was shipped to the United States in 1990 (appendix C2a). These are the only known swordfish shipments to the United States from the Dominican Republic. The authors believe this was an anomalous event, probably fish landed by foreign fishermen. Some minor tuna shipments were also

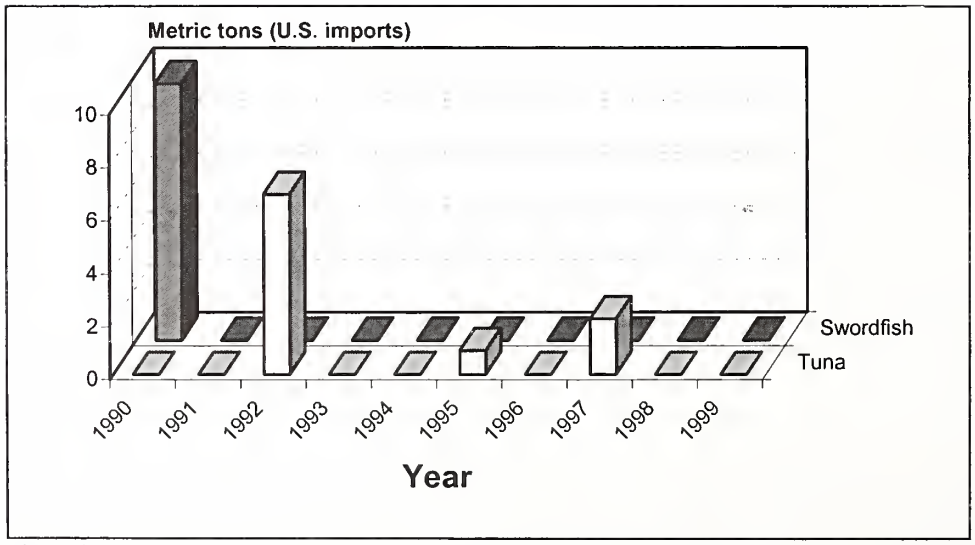

Figure 6.--The United States has reported occasional swordfish and tuna shipments from the Dominican Republic during the 1990s. At least some of these shipments were probably transhipments.

noted during the 1990s (appendix C2c). The fresh tuna shipments reported in 1995 and 1997 may have also been transhipments.

The authors do not note any swordfish or major tuna shipments to any country. This is one reason the authors question the relatively large bluefin catch reported by Dominican officials. This is an extremely valuable fish and it is likely that if bluefin was being landed in large quantities that there would be export shipments.

Most of the Dominican fisheries catch is consumed in the domestic market. There are very limited seafood exports to other countries. Overall Dominican seafood shipments to the United States are very limited, usually only about $1-2 million annually. Shipments in 1999 and 2000 were only $0.5-0.8 million. Shipments in 2001 will be substantially higher because of increased conch shipments. They normally consist primarily of demersal reef species. Conch has been the most important seafood commodity in recent years.

2. Imports

The Dominican Republic does not import swordfish. Dominicans do, however, import substantial quantities of cured fish. Many traditional Spanish and Dominican dishes required cured fish--primarily salt cod.

XIII. Government Policy

The Dominican fisheries agency has for years been the Departamento de Recursos Pesqueros in the Secretaría de Estado de Agricultura. The Secretaría de Estado de Agricultura is the Dominican Ministry (Secretariat of State) of Agriculture. Dominican officials report that recently a new agency was created--the Secretaría de Estado de Medio Ambiente and Natural Resources. This would be the Ministry for the Environment and Natural Resources. Dominican agencies involved with natural resources, such as fisheries, were reorganized under the new ministry. Fishery issues are now handled by the Dirección de Conservación de Recursos Costeros y Marinos.[52]

A. Law

The major Dominican fisheries law was passed in 1938.[53] This law was substantially modified in 1962 by a Ley de Pesca.[54] The authors have no current information on Dominican fisheries legislation. The Secretaría de Recursos Naturales y Medio Ambiente (COSERENAMA) is reportedly assessing a new law to protect the coastal zone. The Centro de Investigaciones de Biología Marina (CIBIMA) at the Universidad Autónoma de Santo Domingo (UASD) is assisting with that project.[55]

B. Limits

The Dominican Republic declared a 6-mile Territorial Sea in 1967.[56] The country declared a 200-mile Exclusive Economic Zone (EEZ) in 1977.[57] Marine boundary agreements have been negotiated with Colombia (1979) and Venezuela (1982). The Dominican Republic signed the Law of the Sea Convention in 1982. Because of the configuration of the Dominican Republic and the neighboring countries, the Dominican EEZ lies primarily to the northeast and south of the country. The northern sector of the EEZ includes the important Silver (Plata) and Navidad Banks.

C. Licenses

Dominican Law requires that countries interested in accessing Dominican coastal waters for their fishermen must negotiate a bilateral agreement.[58]

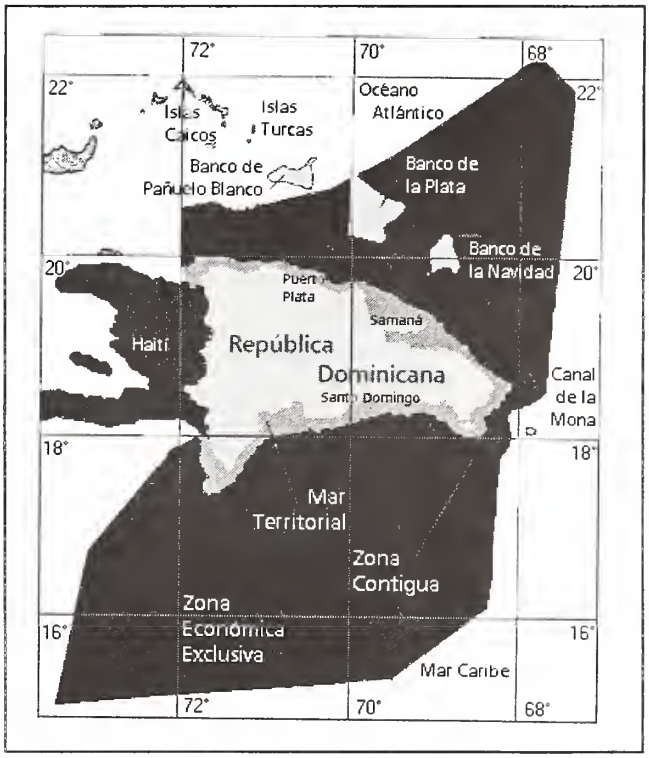

Figure 7.--The Dominican EEZ is primarily located to the northeast and south of the island and includes the Plata (Silver) and Navidad (Christmas) Banks.

Currently there are no such agreements with other countries. Unconfirmed reports suggest, however, that some unauthorized foreign fishing is conducted in Dominican waters. The Dominican Navy has been authorized to conduct fishery patrols,[59] but has a very limited surveillance capability, especially in offshore areas. The authors have no record of any seizures of foreign vessels, but available information is incomplete. The U.S. Embassy in 1993 reported that they were not aware of any Dominican incidents with foreign fishermen.[60]

D. Promotion

Dominican officials are interested in modernizing and expanding the fishing industry. One 1988 report indicated that officials were planning to introduce larger vessels to develop a pelagic fishery and to build improved port facilities.[61]

XIV. Research

There is no known Dominican research program devoted to oceanic pelagics. Local sources know of no researchers currently collecting information on sizes, larvae, location, migration patterns, and other topics concerning pelagic species.[62] The only exception is that some Dominican recreational fishing have collected tournament data on billfish. There has also been some limited research on sea turtles, mainly tagging, focused on assessing distribution.

Club Náutico de Santo Domingo: The Club has collected billfish data from tournaments dating back to the mid-1970s.

Centro de Investigaciones de Biología Marina (CIBIMA): CIBIMA was created in 1972 and is the most active marine research group in the Dominican Republic. They are a unit of the Universidad Autónoma de Santo Domingo's Faculty of Science. CIBMA is involved in a wide range of marine resource projects, including biodiversity, conservation of natural resources, environmental quality, fisheries, and aquaculture.[63] The authors know of no active research on oceanic pelagics. CIBIMA researchers have done some work on fish aggregating devices (FADs).[64]

Departamento de Recursos Pesqueros (DRP): The DRP in the Secretaría de Estado de Agricultura presumably has a fisheries research program, but the authors were unable to obtain information on it. It is unlikely to include any substantial effort on oceanic pelagics.

División Nacional de Parques: Dominican researchers working with the División Nacional de Parques set up a field station to monitor sea turtles at the Jaragua National Park in 1990. Funding was obtained from the Center for Marine Conservation, the U.S. National Park service, and Greater Federation of Women's Clubs.[65]

MAMMA: The Fundación Dominicana para la Investigación y Conservación de Recursos Marinos (MAMMA) is cooperating with ICCAT on billfish research to sample the recreational fishery. MAMMA also obtained historical data from recreational tournaments and data on juvenile billfish.[66]

International organizations have provided some assistance with collecting data needed for research and management.

CARICOM: The Caribbean Community's (CARICOM) Fisheries Resource Assessment and Management Program (CFRAMP) initiated a biological data collection program for large pelagics in 1995. European funding permitted CARICOM to extend the program to Haiti in 1996.[67]

ICCAT: The International Commission for the Conservation of Atlantic Tunas (ICCAT) began working with Dominican officials during the late-1980s as part of the ICCAT Enhanced Research Program for Billfish. The principal database available on Dominican billfish appears to be records maintained by the Club Náutico de Santo Domingo. ICCAT is also working with the Dominican Foundation to Preserve and Research Marine Resources (MAMMA). ICCAT has provided some funding for this effort.[68]

NMFS: The research vessel *Carite* conducted exploratory tuna fishing in 1963-65. Very poor results with long lines were achieved in the relatively shallow Mona Channel between Puerto Rico and the Dominican Republic.[69] Details of exploratory work off neighboring Puerto Rico may offer some insights into Dominican resources.[70]

Nature Conservancy: The U.S. environmental group, the Nature Conservancy, has supported research on reef fish in the Parque Nacional del Este.[71]

Smithsonian: The Smithsonian has sponsored researchers from the University of Florida to work on sea turtles.[72]

University of Florida: Researchers from the University of Florida have done some work on sea turtles.[73]

University of Miami: Researchers at the University of Miami have done some work with Dominican colleagues on demersal reef fish.[74]

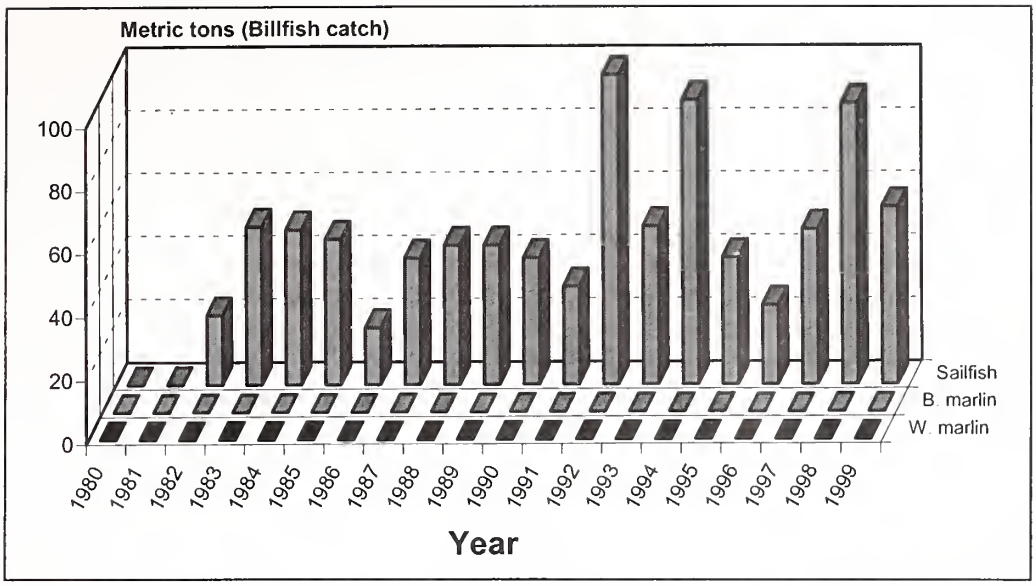

Figure 8.--Fisheries data indicates that the principal billfish take in the Dominican Republic is sailfish and the catches are highly variable. Recreational fishermen report marlins are also taken.

loggerhead (caguano), and leatherbacks (tinglar). Minimum sizes for harvesting sea turtles of 50 cm shell size were established in 1975.[78] Legislation protecting sea turtles was strengthened in 1989 making it illegal to catch turtles or poach eggs.[79] The sale of such products is also illegal unless the turtle died of natural causes. This exception complicates the already difficult enforcement problem. One local observer describes enforcement of turtle protection regulations, in fact, as "more of a pious wish than a reality". Dominican officials have not conducted any study to assess sea turtle populations.[80] The greatest concentration is found around Puerto Plata on the northern coast and Las Calderas on the southern coast where there is some nesting.[81] At least one Dominican official is pessimistic about protecting sea turtles. Dr. Enrique Pugibet, Director of the Dominican National Aquarium, reported in 1996 that sea turtles are considered a special culinary treat in some areas, turtles were still on restaurant menus, and jewelry made from sea turtles is still on the market. Sea turtle grease is used as a skin ointment. While the commercial fishery is so small that it does not constitute a significant threat, the potential market value of a turtle is a inducement for generally low-income artisanal fishermen to retain them.[82] In addition to artisanal fisheries, loss of habitat due to coastal development, especially tourist facilities, and pollution are also factors affecting sea turtles populations in the Dominican Republic.[83] Dominican researchers set up a field station to monitor sea turtles at the Jaragua National Park in 1990.[84]

Marine mammals: While no information is available on interactions with marine mammals, it should be noted that a population of humpbacks calves in Samaná Bay and around offshore banks like Sliver Banks. The Silver Bank appears to be an especially important mating and calving ground, more important than the Mona Passage or the Virgin and Aguilla Bank to the east of Puerto Rico.[85] The presence of humpbacks has engendered the development of a whale watching

XV. Bycatch

The Dominican Republic does not have a swordfish fishery and there is thus no resulting bycatch. Potential bycatch data for the Dominican Republic, as for other Caribbean islands, is very limited. Some idea of Caribbean bycatch trends are available by assessing the data reported by the U.S. longline fleet in its Caribbean operations (Puerto Rico, appendices G1a-b).[75] While this data does not pertain specifically to Dominican waters or fishing strategies used by Dominican fishermen, it does provide potentially useful benchmark data on species present in Dominican waters.

Very little data is available on potential Dominican bycatch species and interactions with fisheries.

Billfish: Dominican fisheries data suggests that the billfish encountered is usually sailfish. Catches have reached almost 100 t annually (appendix B4c). Sport fishermen, however, report that marlins are also taken. Data from the last tournament for which data is available indicates that a substantial number of white marlin were taken.[76]

Sharks: Dominican officials do not list shark as a separate species in the data supplied to FAO. Fishermen are known to have taken sharks, in part with bottom longlines and gillnets.[77] Officials indicate that small quantities of mantas and other rays are taken (appendix B5). Catches exceeded 130 t in 1999.

Turtles: Four species of sea turtles are reported in Dominican waters: green, hawksbill (carey),

industry.[86]

Seabirds: As many as 15 seabirds may nest on the Dominican mainland and offshore cays (appendix E). Beata and Alto Velo are considered as especially important sites for nesting seabirds.[87] We do not know, however, of any available assessments of fishery interactions in the Dominican Republic. As there is no Dominican pelagic longline fishery, this is not a problem, but the level of interactions with artisanal fisheries is unknown.

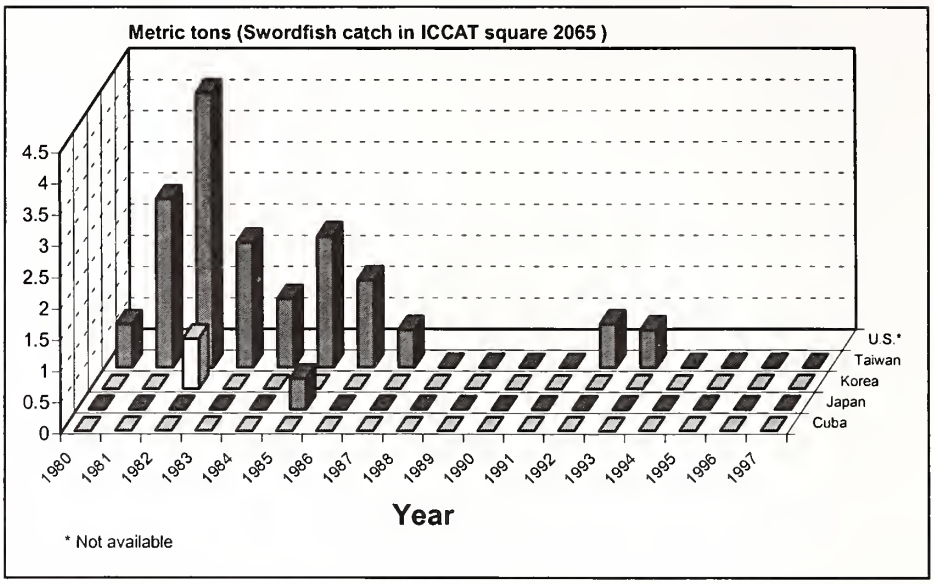

Figure 9.--The primary countries reporting catches in ICCAT square 2065 are Japan, Taiwan, and the United States. Korea reported a large catch in 1979. The U.S. data is not available at this time

XVI. International

A. International relations

1. Multilateral

The Dominican Republic because of the small size of its fishing industry participates in few international organizations working on fisheries. The Dominican Government has not ratified the U.N. Convention on the Law of the Seas (UNCLOS), the Cartagena Convention, or the Convention in Straddling Fish Stocks and Highly Migratory Fish Stocks.

CARICOM: The Dominican Republic is a member of CARICOM, but the authors have no details about its participation concerning fisheries.

ICCAT: The Dominican Republic is not a member of ICCAT, but there is some collaboration with ICCAT programs.[88]

2. Bilateral

The Dominican Republic has very limited international fishery relations, in part because of the small size of the country's fishing industry. Several foreign countries fish in Dominican waters which include areas of four ICCAT statistical squares.[89]

2070: See the Turks and Caicos chapter of this report for fishing activity in this area.

2065: This is the area northeast of the Dominican Republic and includes the offshore Plata and Navidad Banks. Much of the Dominican northern EEZ projects northeast into this ICCAT square (figure 7). Foreign activity in this area will be discussed in this chapter below under each country (appendix D).

1570: ICCAT area 1570 is primarily composed of the Haitian and Dominican EEZs. See the Haiti chapter of this report for details on foreign fishing activity.

1565: ICCAT area 1565 is primarily composed of the Dominican and U.S. Caribbean EEZs. See the Puerto Rican chapter of this report for details on foreign fishing activity.

Some information is available on Dominican fishery relations with individual countries.

Cuba: The authors know of no Cuban-Dominican fishery relations. Cuban longliners do not operate in ICCAT square 2065 (appendix D).

European Union: The Dominican Republic participates in the EU-financed biodiversity management program administered by the Caricom Fisheries Unit in Belize.[90]

Japan: Japanese longliners have operated in ICCAT square 2065. The first swordfish catches were reported in 1962 and fishing during the second and third quarter was reported continuously through 1971 (appendix D). Catches were limited, peaking at 5-6 t in 1963-64. Since 1971 there has been no Japanese fishing, except for 1985. The Japanese, for example, reported no billfish and other swordfish fishing off the Dominican Republic during 1993.[91]

Korea: Korean fishermen have reported very limited activity in ICCAT square 2065. Swordfish catches were reported in 1977-79 and 1982. In the second quarter of 1979, Korean fishermen reported a

swordfish catch of nearly 36 t (appendix D).

Spain: Spanish longline fishermen do not operate as far west as ICCAT square 2065 (appendix D).[92]

Taiwan: Taiwan, like the Japanese, initiated Caribbean-area longline operations in the 1960s. The primary Taiwan activity has been to the north of the Caribbean, as far as Bermuda, where they have targeted albacore to supply Puerto Rican canneries packing "white meat" tuna.[93] Many of the vessels have operated out of St. Maarten.[94] The Taiwan longliners seasonally deploy their longliners in the southern portion of the albacore's range including waters to the north of the Dominican Republic. Taiwan in the 1990s has developed and even larger longline operation out of Port-of-Spain, Trinidad.[95] The authors have no details at this time that the Port-of-Spain-based vessels are deployed in the albacore fishery to the north of the Dominican Republic. The Turks and Caicos Islands, for example, has licensed Taiwan longliners for operations in their 200-mile EEZ located north of the Dominican EEZ. Data reported to ICCAT indicated that Taiwan fishermen began taking swordfish in ICCAT square 2065 during 1968 and they fished the area regularly in the 1970s and 80s. Some fishing was also reported in 1992-93. The Taiwan fishermen were most active in the second and, to a lesser extent, the third quarter. Swordfish catches were limited, often less than 1 t and rarely exceeded 2 tons. The largest catch was 5 t in 1979 (appendix D).

Turks and Caicos: Dominican and TCI officials reportedly signed a variety of commercial and cultural agreements in 1983, including one granting Dominican fishermen associated with the Institute for Cooperative Development and Credit (IDECOOP) access to TCI waters.[96] Dominican fishermen are especially interested in the Mouchoir Bank (Pañuelo Blanco) where they once extensively fished.

United States: The United States began developing a longline fleet targeting yellowfin tuna in the Gulf of Mexico. U.S. longline fishermen began targeting swordfish in the mid-1980s after commercial stocks were encountered off the Florida Atlantic coast.[97] A small number of U.S. swordfish/tuna longliners are active in the wider-Caribbean, including grounds to the north and east of Puerto Rico. The U.S. Caribbean fishery is highly seasonal, primarily conducted during the winter months. The U.S. effort in the Caribbean can vary significantly from year to year (Puerto Rico, appendix A2b). The level of effort is strongly affected by fuel prices.[98] Most of the U.S. effort is outside the Caribbean Arc. U.S. pelagic longline fishermen within the Caribbean often fish in the northeastern Caribbean, but generally to the south of Puerto Rico, (figure 10). Actual data on U.S. fishing in ICCAT square 2065 is not readily available.[99] Areas of the square are within both the Dominican and United States EEZs. Unlike the Windward Passage between Cuban and Haiti, there appears to be much less fishing in the Mona Passage between the Dominican Republic and Puerto Rico.[100] Puerto Rican officials during the late 1970s discussed a variety of possible fishery arrangements with Dominican Republic officials.[101] United States and Dominican Republic officials also discussed fisheries access and other issues in 1982.[102]

B. Joint ventures

Companies interested in forming a Dominican joint fishery venture must register the company in the Dominican Republic and have a local partner with a controlling (at least 51 percent) equity interest.[103] No such ventures are known to have been formed.[104]

Puerto Rico: The Puerto Rican Commonwealth Government in 1985 helped finance a joint tuna processing venture at Manzanillo in the Dominican Republic. The project was based on the twin-plant concept where low-paid Dominican workers would prepare tuna loins for canning at Puerto Rican canneries.[105] The lower wage rates in the Dominican Republic made it economic to conduct the labor-intensive operation of processing the loins in the Dominican Republic rather than in Puerto Rico. The Dominican Government in 1985 signed a $25 million

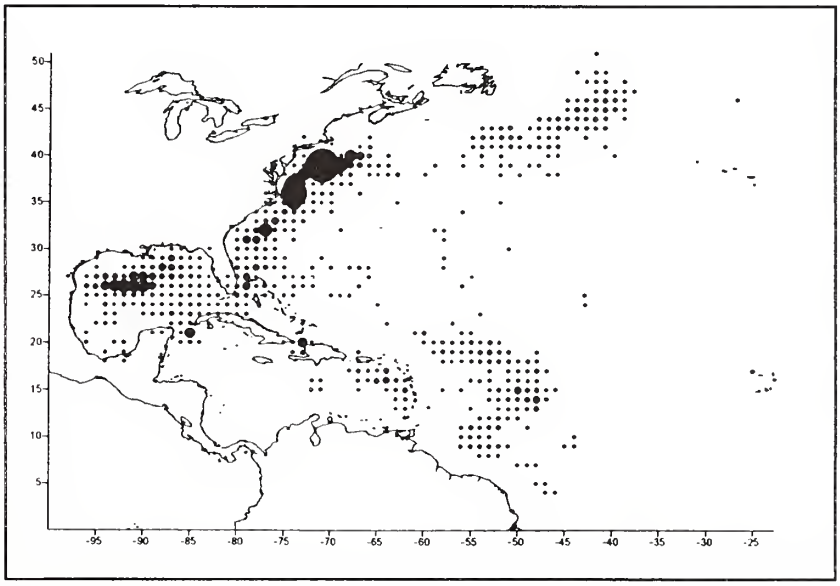

Figure 10.--U.S. fishermen in 1995 reported more fishing within the Caribbean Arc than usual. There was even some fishing south of the Dominican Republic. Jean Cramer

contract with domestic companies to set up a tuna processing plant, Dominicana de Atún, at Manzanillo. The plant owned by Francisco Torres was to process 200 t of tuna daily, producing loins that would be canned in Puerto Rico.[106] The U.S. Star Kist company announced in 1987 that they had decided not to open a cannery at Manzanillo.[107]

C. Foreign aid

The authors have noted only limited foreign assistance projects for the Dominican Republic's small fishing industry.

Canada: The Canadian International Development Research Centre (IDRC) reported a small aquaculture project in 1982.[108]

FAO: FAO specialists were active in the Dominican Republic during the early 1980s training Dominican officials. Plans called for building a national training center.[109] Dominican officials faced with a large number of small artisanal craft operating from more than 70 landing sites, many scattered along isolated areas asked FAO for assistance in 1988 to improve its fisheries data collection system. FAO approved a 6-month project.[110]

IDB: The Inter-American Development Bank (IDB) assisted the Dominican Government with a project to help Dominican fishermen's cooperatives buy 2 shrimp trawlers and 64 smaller boats of varying sizes up to 20-m long. The vessels were to be deployed in hook and line fisheries for snapper, tuna, rockfish, king mackerel, and dorado. The boats were built in Mexico.[111]

Japan: The Japanese in 1992 funded an assistance program (CEDEP) to build a training facility at Samaná.[112] They were reportedly actively working in the late 1990s with both Dominican technicians and fishermen to modernize fishing methods.

Korea: The Korea Fisheries Agency sponsored a fisheries technical adviser in 1981.[113]

Taiwan: Taiwan in the 1990s supports a fisheries project at Azua. As in some other Caribbean countries, the Taiwan project focuses on aquaculture, in this case marine shrimp culture.[114]

United States: The United States has supported a few small aquaculture projects. One project involved crab.[115] Another project involved Auburn University's International Center for Aquaculture which worked on tilapia and carp with Church World Services.

XVII. Enforcement

Neighboring countries have reported a few incidents with Dominican fishermen. The most common such incidents are reported by Bahamian and United States authorities.

Bahamas: Bahamian newspapers report numerous and continuing incidents with Dominican fishing vessels. Many are small artisanal craft, but some are larger vessels with crews of about 20. Bahamian authorities arrested 5 Dominican fishermen on November 14, 1977, they were not released until March 28, 1978.[116] Press reports indicated that in 1979, 54 Dominican fishermen were being detained in Bahamian jails, some as long as 3 months. One group of 25 fishermen was arrested when their vessel *Conchita*, operating from Puerto Plata, was seized.[117] The Dominican fishermen are primarily targeting demersal resources. Bahamian officials seized Dominican fishing vessels (*Pili*, *Virgin Mary I*, and *Virgen Mary II*) in January 1983 and assessed a substantial fine.[118] The authors have not noted similar incidents of Bahamian fishermen operating in Dominican waters.

Cuba: Cuban authorities detained nine Dominican fishermen in January 1980.[119] Dominican Republic authorities seized a Cuban fishing boat on September 9, 1981.[120]

Jamaica: The Jamaican Defense Force (JDF) on May 22, 1986 seized a Dominican mother boat and eight catcher boats and arrested 32 Dominican fishermen who were fishing without a license for lobster on the Pedro Bank south of Jamaica. The fishermen and officers of the boat were fined J$8,400 and the vessel, gear, and equipment were confiscated.[121]

Puerto Rico (United States): Many of the incidents in Puerto Rican waters with foreign countries involve the Dominican Republic. The authors, however, only have references to quite dated incidents. Much of the Puerto Rican artisanal catch is taken along the island's western coast, giving rise to occasional incidents with the Dominicans. Dominican officials, for example, seized the 13 m Puerto Rican fishing boat *El Monseratte* in July, 1978. The fishermen were fined $50 each.[122] Dominican officials also seized the *Antares* in 1978.[123] Many incidents do not involve fisheries, but the smuggling of illegal aliens into Puerto Rico. The often dilapidated boats used sometimes have tragic consequences. In one such incident a boat sank 15 km from shore. The boat carried as many as 130 people, many or whom drowned or were attacked by sharks, according to the fishermen who managed to save a handful of survivors.[124]

Turks and Caicos: British authorities arrested 11 Dominican fishermen in June 1976.[125] The

Dominican fishing boat *Pescamar* was fired on by British boats, presumably TCI Police.[126] TCI Police seized a Dominican fishing boat with a 18-man crew during February 1979.[127] TCI police seized four small Dominican boats and arrested four fishermen during May 1983.[128] Gunfire was exchanged in the process of arresting the fishermen. The four small boats seized were part of a mother boat operation. Someone on the mother boat fired on the TCI police with an automatic weapon and the police returned fire. There were no casualties. The mother boat managed to escape.[129]

XVIII. Future Trends

The Dominican Republic has a very small fishing industry. Most of the catch is taken by artisanal fishermen from small boats using rudimentary gear. The fishermen report a small tuna and billfish catch, but no swordfish. Reported bluefin tuna catches can not be confirmed at the time. There is some demersal longlining by artisanal fishermen, taking some sharks along with groupers and other species. The authors, however, know of no Dominican pelagic longline fleet. There is no indication at this time that Dominican fishermen are planning to acquire commercial longliners and enter the longline fishery for swordfish or other oceanic pelagics.

* * * * *

Note: This chapter was designed and formatted by Kori Cole, a senior at Friendly Senior High School in Fort Washington. Mr. Cole worked with the National Oceanic and Atmospheric Administration as part of the HIGH SCHOOL\HIGH TECH Program. He plans to go to college.

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Endnotes

SECTION I. (Overview)

1. The authors know of no current overview of the Dominican fishing industry. The most detailed report known to the authors is Fisheries Development Limited (FDL), *Desarrollo Pesquero en la República Dominicana* (FDL/INDOTEC: Santo Domingo, 1980), 435p. While now dated it still provides a great deal of useful information about Dominican fisheries.

SECTION II. (Species)

2. Charlene Grall and Donald P. de Sylva, "Distribution, relative abundance, and seasonality of swordfish larvae," *Transactions of the American Fisheries Society*, Vol. 112, 1983, pp. 238-239. Grall and de Sylva present two graphics (figures 1 and 3) showing larval abundance in the Caribbean, Figure 1 suggests that the area north and northeast of the Dominican Republic is an area of great abundance of swordfish larvae. Figure 3 shows relatively limited abundance. The differences between these graphics is not well explained in the text if the article, but the authors of this study believe that the inference of relative abundance inferred by figure 1 may be the correct conclusion.
3. John Jeffrey Govoni, Bruce Stender, and Oleg Pasuk, "Distribution of larval swordfish, *Xiphias gladius,* and probable spawning off the southeastern United States," in press, advanced copy provided the authors in November 1998.
4. The fishing activity may be a reflection of the relative abundance of the fish, but this is not always the case as a variety of factors such as national fisheries enforcement, effectiveness of gear, topographical or current features affecting behavior and a variety of other factors could also affect fishing effort and yields.
5. Enrique Pugibet, Director, Acuario Nacional, personal communications, February 19, 2001.

SECTION III. (Fishing grounds)

6. M. Giudicelli, "Aspectos técnicos de la pesca artesanal en la República Dominicana y recomendaciones para su majoramiento y desarrollo," *Informes WECAF*, No. 5 (FAO-WECAF: Rome, June 1979), p. 3.
7. Judy Lang, *et. al.,* "Status of coral reefs in the northern areas of the wider Caribbean," *Status of Coral Reefs in the World: 1998*, internet posting accessed January 11, 2001: http://www.aims.gov.au/pages/research/coral-bleaching/scr1998/scr-08.html
8. Giudicelli, "Aspectos técnicos ...," *op. cit.*, p. 9.
9. Omar Ramirez Tejada, Rosa A. Lamelas, and Arturo López, "Samaná biosphere reserve, Dominican Republic," internet site accessed January 11, 2001: http://www.iucn.org/themes/ssp/dominican.html
10. Decreto 319-86, October 14, 1986. Further legislation on the sanctuaries was passed in 1996. Decreto 233-96, July 1996.
11. Enrique Pugibet, Director, Acuario Nacional, personal communications, February 19, 2001.

Section IV. (Fleet)

12. Felicita Heredia L., Directora de Conservación Costera Marina, personal communications, July 16, 2001.
13. Giudicelli, "Aspectos técnicos ...," *op. cit.*, pp. 4-5.
14. FDL, *Desarrollo Pesquero*, p. 69. The same source suggests nearly 2,200 craft on page 34.
15. Rolf Juhl, NMFS, memorandum, March 25, 1988.
16. Giudicelli, "Aspectos técnicos ...," *op. cit.*, pp. 4-5.
17. Giudicelli, *op. cit.*, pp. 5-6.
18. Heredia, *op. cit.*, September 7, 2001.

19. See the Dominican Republic chapter in Dennis Weidner and David Hall, "Latin America," *World Fishing Fleets* (NMFS: Silver Spring, Maryland, 1993).
20. Heredia, *op. cit.*, September 7, 2001. Operators of whale watching boats off the north coast have also not observed any longliners. Lawrence Gale, personal communications, January 15, 2001.
21. U.S. Embassy, Oslo, August 18, 1993 and "Barents Sea Cod," *Bill Atkinson's News Report*, September 1, 1993, p.4.
22. U.S. Embassy, Oslo, August 18, 1993 and "Barents Sea Cod," *Bill Atkinson's News Report*, September 1, 1993, p.4.
23. Giudicelli, "Aspects técnicos ...," *op. cit.*, p. 6.

SECTION V. (Shipyards)

24. U.S. Embassy, Santo Domingo, July 30, 1993.

SECTION VI. (Fleet Operations and Gear)

25. One photographer working with a whale watching operation taking tourists out to Silver Banks reports that they have not encountered any longliners. Amos Nachoum, personal communications, January 11, 2001.
26. Giudicelli, "Aspectos técnicos ...," *op. cit.*, p. 4.
27. Juhl, *op. cit.*, March 25, 1988.
28. FDL, *Desarrollo Pesquero*, *op. it.*, pp. 23-24 and Giudicelli, "Aspectos técnicos ...," *op. cit.*, pp. 4-5.
29. Dominican fisheries director Felicita Heredia informs the authors that she has received a report on the use of the longline by local fishermen and is preparing a summary. Heredia, *op. cit.*, July 16, 2001. Unfortunately the information was not received in time for inclusion in this report.
30. Giudicelli, "Aspectos técnicos ...," *op. cit.*, pp. 7-8.
31. FDL, *Desarrollo Pesquero*, *op. it.*, pp. 23-24; Giudicelli, "Aspectos técnicos ...," *op. cit.*, pp. 4-5; and Juhl, *op. cit.*, March 25, 1988.
32. Giudicelli, "Aspectos técnicos ...," *op. cit.*, p. 8.
33. See for example Stephen Frink, "Destination unknown--Dominican Republic," *Rodale's Scuba Diving*, June 2000.
34. TravelFacts.com, "Dominican Republic," internet site accessed January 11, 2001: http://www.travelfacts.com/tfacts/htm/dr/drsport.htm
35. Larry Larsen, "Dominican Republic outdoors," internet site accessed January 11, 2001: http://www.larsenoutdoors.com/Travel/Dominican/dominican.html
36. "Calendar," *The International Angler*, May-June, 1999, p. 19.
37. "Barta classic expands goal to raise million for IGFA juniors," *International Angler*, November-December 1999, pp. 17-19.
38. Laurie Wright, entry in "International reports," website retrieved August 6, 2000: http://www.fishtheworld.com/intlreports/caribbean.html
39. Heredia, *op. cit.*, August 22, 2001.

SECTION VII. (Catch)

40. U.S. and Japanese import data shows no imports of bluefin tuna from the Dominican Republic. If the country was catching sizeable quantities of bluefin, they would almost surely be exporting much of it.
41. ICCAT does, for example, not report these large quantities of bluefin for the Dominican republic in its annual statistical report, although they do not appear to have current information. The authors asked FAO as to how sure they were that the bluefin reported was correctly identified. FAO responded that for many countries fishing tunas in the Atlantic that they have recently adopted the policy of using ICCAT data. They did not do this for the Dominican Republic because ICCAT has not had a recent report on Dominican tuna catch. A Dominican official, however, has submitted timely, detailed data on Dominican catches to FAO. The substantial bluefin catches published are included in those submissions. Adele Crispoldi, FAO Department of Fisheries, personal communications, August 22, 2001. One factor which may be affecting how bluefin is being reported is the

confusing common name of the species. While in English the species is bluefin, in French it is "thon rouge"--red tuna. ICCAT uses "atún rojo" in Spanish, but FAO uses "atún comun". Of course reporting officers should go by the scientific name *Thunnus thynnus thynnus*, but the different comun names can be confusing.
42. Dominican fishery officials assure the authors that their fishermen are catching bluefin, but that the 1999 catch was only 174 tons. Heredia, *op. cit.*, August 22 and 24, 2001. While still a substantial quantity of bluefin, this is smaller than the quantity reported in the FAO *Yearbook*. The authors can not explain the difference between these two bluefin catch statistics. The FAO figure is based also based on data supplied by Dominican officials.
43. Wright, "International reports," *op. cit.*

SECTION VIII. (Ports)

44. U.S. Embassy, Santo Domingo, "Proposed Star Kist tuna operation in Dom. Rep.," message number 11567, October 17, 1985 and Máximo Manuel Pérez, "Hernández Colón, Jorge Blanco firman contratos tres plantas," *Jirtin Diario*, September 14, 1985, p. 2.
45. TravelFacts.com, "Dominican Republic," internet site accessed January 11, 2001: http://www.travelfacts.com/tfacts/htm/dr/drsport.htm

SECTION IX. (Transshipments)

46. U.S. Embassy, Santo Domingo, July 30, 1993.
47. Craig Lilyestrom, Puerto Rico Department of Natural and Environmental Resources, personal communications, June 18, 1999.
48. Heredia, *op. cit.*, September 13, 2001.

SECTION X. (Processing and Products)

49. ICCAT, "Program of the Enhanced Research Program for Billfish during 1988," *ICCAT Report*, 1988-89, Part I, (ICCAT: Madrid, Spain, 1989), p. 231.

SECTION XII. (Markets)

50. A good overview of the Dominican food market has been prepared for the U.S. Department of Agriculture (USDA) Foreign Agricultural Service (FAS). It includes, however, little information specifically about fish. Susan Schaves, "Dominican Republic," *Export Guide to the Consumer Food Market* (USDA-FAS/Fintrac, September 1997).
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52. Heredia, *op. cit.*, March 14, 2001.

SECTION XIII. (Government Policy)

53. Law no. 1518, June 18, 1938.
54. Ley de Pesca, law no. 5914, May 22, 1962.
55. Dominican Government, "Aspectos del desarrollo sostenible referentes a los recursos naturales en Dominican Republic," internet posting accessed January 11, 2001: http://www.un.org/esa/agenda21/natlinfo/dominican/natur.htm
56. Law No. 186, September 13, 1967.
57. Law No. 537, March 1977.
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59. Law No. 3003, 1951.
60. U.S. Embassy, Santo Domingo, July 30, 1993.
61. Juhl, *op. cit.*, March 25, 1988.

62. Pugibet, *op. cit.*, February 19, 2001.
63. CIBIMA, "Centro de Investigaciones de Biología Marina," internet site accessed January 12, 2001: http://www.cep.unep.org/rep_dom/CIBIMA.htm
64. Pugibet, *op. cit,*, February 19, 2001.

SECTION XIV. (Research)

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66. ICCAT, "Progress of the Enhanced Research Program for Billfish during 1989," *ICCAT Report*, 1988-89, Part I, (ICCAT: Madrid, Spain, 1989), p. 240.
67. CARICOM/CFRAMP, "Statement by the CARICOM (Caribbean Community) Fisheries Resource Assessment and Management Program (CFRAMP)," ICCAT Doc. No. 018, November 13, 1995.
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69. Kyotaro Kawaguchi, "Exploratory tuna longliner fishing in the Caribbean and adjacent waters," *Marine Fisheries Review*, October, 1976, p. 62.
70. For details see the Puerto Rican chapter of this report.
71. G. Bustamante, *et. al.*, "Reef fish assemblages and fisheries in Parque Nacional del Este, Dominican Republic," paper delivered in 1997, Vol. 50 (GCFI: Fort Pierce, Florida, 1998), p. 919.
72. U.S. Embassy, Santo Domingo, "Conservation of sea turtles," message number 6932, November 2, 1979.
73. U.S. Embassy, Santo Domingo, "Conservation of sea turtles," message number 6932, November 2, 1979.
74. Bustamante, "Reef fish assemblages ...," *op. cit.*, p. 919.
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82. U.S. Embassy, Santo Domino, "Dominican environmental news," message number 192, January 11, 1996.
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SECTION XVI. (International)

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SECTION XVII. (Enforcement)

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123. "Existe un conflicto pesquero entre Puerto Rico y República Dominicana," *Diario las Americas*, April 15, 1978.
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Appendices

Appendix A.--Dominican Republic. Fleet data, 1980

Zone	Boat type*				Total
	Canoes	Yawls	Boats	Commercial	
			Number		
Northern Coast					
Montecristi	-	17	8	1	26
Puerto Plata	98	91	9	24	222
Samaná	888	81	30	10	1,009
Eastern Coast					
La Mona	2	31	4	-	37
Saona	4	105	25	-	134
Southern Coast					
Santo Domingo	-	304	10	3	317
Ocoa	-	205	11	-	216
Beata	4	320	71	-	395
Total	996	1,154	168	38	2,356

* Boat types:
Canoes - canoas
Yawls - yolas (undecked boats)
Boats - botes (small decked boats)
Commercial boats - barcos
Source: Fisheries Development Limited, *Desarrollo Pesquero en la República Dominicana* (FDL/INDOTEC: Santo Domingo, 1980), p. 69.

Appendix B1.--Dominican Republic. Fisheries catch, 1980-99

Year	Catch
	Metric tons
1980	10,658
1981	12,003
1982	13,169
1983	15,289
1984	14,614
1985	18,338
1986	17,182
1987	20,122
1988	12,635
1989	21,624
1990	19,770F
1991	16,725
1992	12,780
1993	13,016
1994	22,878
1995	17,977
1996	13,811
1997	14,509
1998	10,171
1999	8,521

F - FAO estimate
Source: FAO, *Yearbook of Fishery Statistics*, (FAO: Rome, various years).

Appendix B2.--Tuna catch, 1990-99

Year	Species		
	Skipjack	Bluefin*	Blackfin
		Metric tons	
1990	110F	100F	520F
1991	156	98	536
1992	135	125	110
1993	143	86	133
1994	257	155	239
1995	146	138	892
1996	123	85	518
1997	231	624	323
1998	158	196	89
1999	72	394	73

F - FAO estimate
* It is unclear to the authors how accurate the Dominican species identification is. These are relatively large quantities of bluefin, especially the 1997 catch. Information is also unavailable on how the species is being utilized.
Source: FAO. *Yearbook of Fishery Statistics*, various years.

Appendix B3.--Other oceanic pelagic catch, 1990-99

Year	Species		
	Dorado	Mackerel	
		Spanish	Cero
		Metric tons	
1990	230F	1,290F	50F
1991	150	728	735
1992	200	45	79
1993	225	739	50
1994	405	1,330	90
1995	89	2,042	29
1996	237	1,648	57
1997	113	589	288
1998	151	289	191
1999	175	-	230

Source: FAO. *Yearbook of Fishery Statistics*, various years.

Appendix B4a.--Dominican Republic. Billfish catches, 1970-79

Species	Year									
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
					Metric tons					
Marlin										
Blue	-	-	-	-	-	-	-	-	-	-
White	-	-	-	-	-	-	-	-	-	-
Sailfish	-	-	-	-	-	-	-	-	-	-
Total										

Source: ICCAT, *ICCAT Report*, 1986-87, Part II, (ICCAT: Madrid, Spain, 1988), pp. 184-186.

Appendix B4b.--Dominican Republic. Billfish catches, 1980-89

Species	Year									
	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
	Metric tons									
Marlin										
Blue	-	-	-	-	-	-	-	-	-	-
White	-	-	-	-	-	-	-	-	-	-
Sailfish	-	-	22	50	49	46	18	40	44	44
Total	-	-	22	50	49	46	18	40	44	44

Source: ICCAT, *ICCAT Report*, 1992-93, Part II, (ICCAT: Madrid, Spain, 1993), pp. 254-258.

Appendix B4c.--Dominican Republic. Billfish catches, 1990-99

Species	Year									
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
	Metric tons									
Marlin										
Blue	-	-	-	-	-	-	-	-	-	-
White	-	-	-	-	-	-	-	-	-	-
Sailfish	40F	31	98	50	90	40	25	49	89	56
Total	40	31	98	50	90	40	25	49	89	56

F - FAO estimate
Source: FAO, *Yearbook of Fishery Statistics*, various years.

Appendix B5.--Dominican Republic. Rays, stingrays, and mantas,* 1990-99

Year	Catch
	Metric tons
1990	80F
1991	85
1992	46
1993	10
1994	18
1995	90
1996	39
1997	96
1998	62
1999	134

* Sharks are not listed as a separate species in the data Dominican authorities supplied FAO.
Source: FAO, *Yearbook of Fishery Statistics*, various years.

Appendix C1.--Dominican Republic. Swordfish exports by destination, 1991-2000

Destination	Year										
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	Metric tons										
United States	-	-	-	-	-	-	-	-	-	-	-*
Japan**	-	-	-	-	-	-	-	-	-	-#	NA
European Union	NA	-	-	-	-	-	-	-	-	-	NA
Others***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total	NA	-	-	-	-	-	-	-	-	-	NA

* Through October
**Estimated swordfish portion of billfish shipments
*** Swordfish shipments to other countries are believed to be non-existent or negligible
# Through November
Source: Various

Appendix C2a.--United States. Swordfish imports from the Dominican Republic, 1975-2000

Year	Commodity		Total*
	Fresh	Frozen	
	Metric tons		
1975	-	-	-
1976	-	-	-
1977	-	-	-
1978	-	-	-
1979	-	-	-
1980	-	-	-
1981	-	-	-
1982	-	-	-
1983	-	-	-
1984	-	-	-
1985	-	-	-
1986	-	-	-
1987	-	-	-
1988	-	-	-
1989	-	-	-
1990	9.7	-	9.7
1991	-	-	-
1992	-	-	-
1993	-	-	-
1994	-	-	-
1995	-	-	-
1996	-	-	-
1997	-	-	-
1998	-	-	-
1999	-	-	-
2000	-	-	-

* Totals may not agree due to rounding.
** Through February
Source: U.S. Bureau of the Census

Appendix C2b.--United States. Swordfish imports from the Dominican Republic, 1975-2000

Year	Commodity		Total*
	Fresh	Frozen	
	US$1,000		
1975	-	-	-
1976	-	-	-
1977	-	-	-
1978	-	-	-
1979	-	-	-
1980	-	-	-
1981	-	-	-
1982	-	-	-
1983	-	-	-
1984	-	-	-
1985	-	-	-
1986	-	-	-
1987	-	-	-
1988	-	-	-
1989	-	-	-
1990	47	-	47
1991	-	-	-
1992	-	-	-
1993	-	-	-
1994	-	-	-
1995	-	-	-
1996	-	-	-
1997	-	-	-
1998	-	-	-
1999	-	-	-
2000	-	-	-

* Totals may not agree due to rounding
Source: U.S. Bureau of the Census

Appendix C2c.--United States. Tuna imports from the Dominican Republic, 1990-2000

Year	Imports*		Product
	Metric tons	US$1,000	
1990	-	-	
1991	-	-	
1992	6.8	34.6	Canned albacore
1993	-	-	
1994	-	-	
1995	0.9	2.0	Fresh yellowfin
1996	-	-	
1997	2.1	5.8	Unidentified fresh tuna
1998	-	-	
1999	-	-	
2000	-	-	

* Although reported as imports from the Dominican Republic, these shipments are more likely to have been transhipments by a non-Dominican fishermen through Dominican ports.
Source: U.S. Bureau of the Census

Appendix D.--ICCAT square 2065.* Foreign swordfish catches by quarter, 1959-97

Country	Year	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total
		Metric tons				
Cuba	No Cuban activity					
Japan	1962		0.1	1.6		1.7
	1963		5.1			5.1
	1964	0.7	4.3	0.5		5.5
	1965		1.2	0.6	0.8	2.6
	1966		2.1	0.3		2.4
	1967		0.2			0.2
	1968		0.3			0.3
	1969			0.1		0.1
	1970		1.3	0.9		2.2
	1971		0.3	0.4		0.7
	1985			0.5		0.5
Korea	1977			0.4		0.4
	1978		2.7			2.7
	1979	0.2	35.6	2.4		38.2
	1982		0.4	0.4		0.8
Spain	No Spanish activity					
Taiwan	1968			1.8	0.2	2.0
	1972		0.2			0.2
	1974		1.4	0.2		1.6
	1975		0.4	0.4		0.8
	1976			2.7		2.7
	1977		0.6	0.6		1.2
	1978		1.8			1.8
	1979		5.2			5.2
	1980		0.5	0.2		0.7
	1981		2.7			2.7
	1982	0.3	3.8	0.3		4.4
	1983		2.0			2.0
	1984		0.7	0.4		1.1
	1985	0.8	1.3			2.1
	1986		1.4			1.4
	1987	0.5	0.1			0.6
	1992		0.7			0.7
	1993		0.6			0.6
United States	U.S. fishing data unavailable**					

* ICCAT square are 5° degree squares of latitude and longitude. The first two numbers are the latitude and the second two numbers are the longitude. This represents the southeastern corner of the 5° square for catches in quadrant 4, northwest Atlantic.

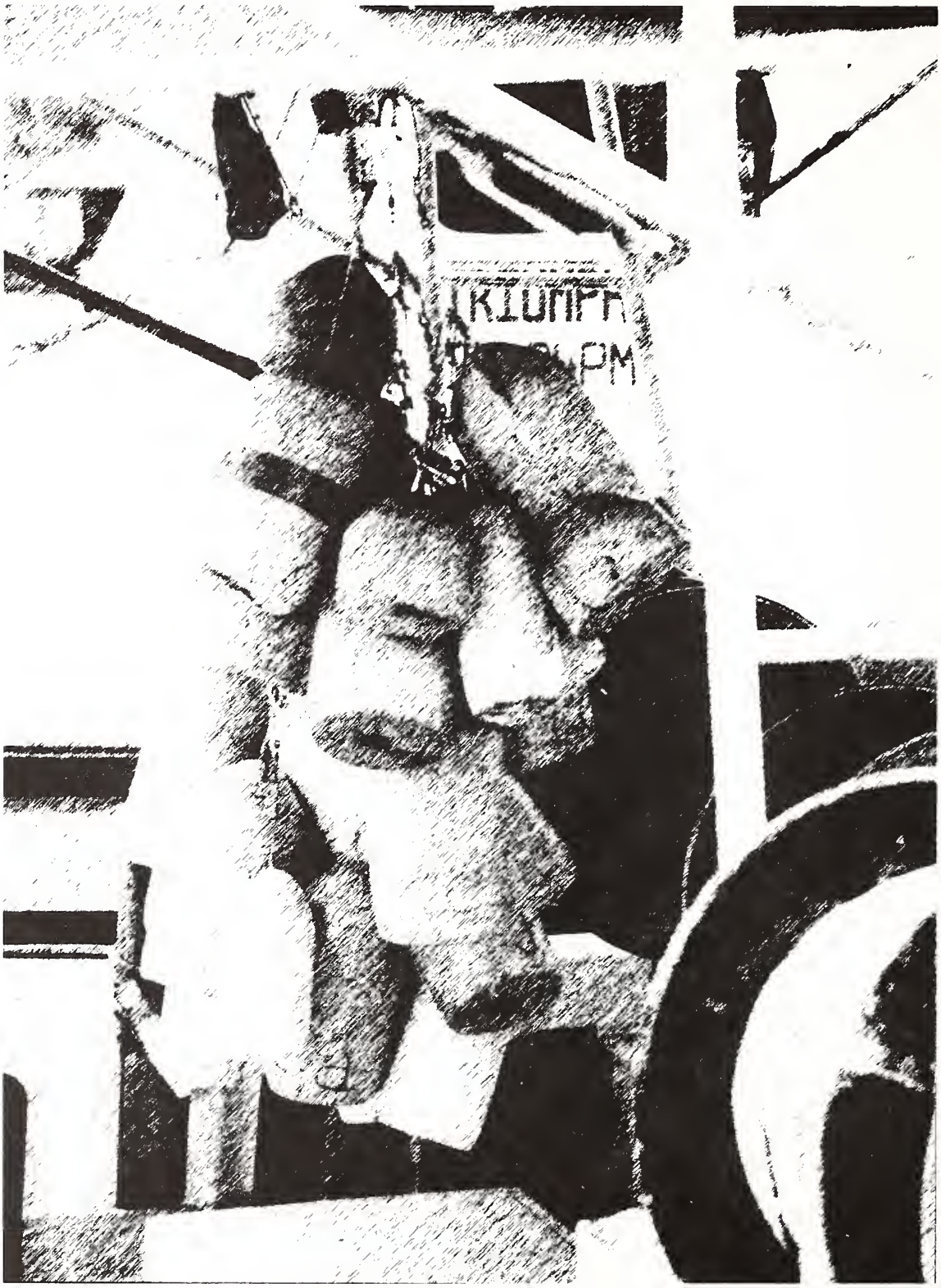
** The authors encountered apparent statistical problems with the U.S. data on the ICCAT web site. Apparently ICCAT is in the process of recalculating the 1° square data by 5° squares. As a result this data was not added to this appendix.

Source: ICCAT: http://www.iccat/es/Stats.html, retrieved July 3, 2000

Appendix E.--Hispaniola#. Seabird nesting, 1984

Area	Information	Species*	Known** threats	Importance***
Navassa Island##	Poor	3?, 7, 9, 10, 12?, 13?, 14?, 16? 18?, 19, 22	Pr?, Ex?, Ha?	Important
Haiti###	Poor	1, 3?, 6, 7?, 10, 11?, 12?, 16? 18, 19, 20?, 22	Ex, Ha, Pr?	Extremely important
Dominican Republic				
Mainland	Reasonable	1, 3?, 6, 7?, 11, 12, 13?, 14? 16?, 17?, 20, 22?	Ex, Ha, Pr?	Important
Beata and Alto Velo	Reasonable	6, 10, 11, 16?, 18?, 19, 20, 22?	Ex, Ha?, Pr?	Extremely important
Saona and Catalinita	Poor	7, 11?, 12, 16?, 17?, 18?, 20, 22	Ha, Ex	Important
Bahía Samaná###	Poor	7, 10, 11, 14?, 16?, 18	Ex, ?	Important

Hispaniola includes both the Dominican Republic and Haiti and we have included the associated offshore cays.
Navassa is a guano island under U.S. jurisdiction. Haiti also claims the island.
Including offshore cays
* Species: 1 - Pterodroma h. hasitata; 3 - Puffinus I. lherminieri; 6 - P. lepturus; 7 - Fregata magnificens; 10 - S. leucogaster; 11 - Pelecanus occidentalis; 12 - Larus atricilla; 13 - Sterna maxima, 14 - S. sandvicensis acuflavida; 16 - S. dougallii; 18 - S. anaethetus; 19 - S. fuscata; 20 - S. (albifrons) antillarum; 22 - A. stolidus
** Threats: Ex - exploitation of eggs, young or adults; Pr - predators, generally introduced mammals; Ha - habitat destruction or disturbances; Po - pollution; Fi - fisheries
*** A rough subjective rating of relative importance of area for breeding seabirds.
Source: Ruud van Halewyn and Robert L. Norton, "The status and conservation of seabirds in the Caribbean," in J.P. Croxall, P.G.H. Evans, and R.W. Schreiber (eds.), "Status and conservation of the world's seabirds," *ICBP Technical Publication*, No. 2 (ICBP: Cambridge, 1984), pp. 175-176.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11

GRENADA

Grenada is one of the eastern Caribbean islands with a substantial offshore pelagic fishery. Grenadian fishermen have the advantage of favorable environmental conditions. As was common in the Caribbean, lack of modern equipment and fisheries technology limited the ability of the fishermen to fully utilize the available resource. Grenada, like several other Caribbean islands, is making the transition from a largely artisanal fishing industry, to a small-scale commercial industry. In that regard, Grenada has made more progress than many of the other small Caribbean islands. Grenada is one of the southeastern Caribbean islands that has successfully developed a small longline fishery. The Grenadian fishery was distinct in that it was initiated as part of the Cuban assistance program in the early 1980s. The Cubans introduced artisanal, non-mechanized longline methods. The Cuban methods were especially appropriate for a small Caribbean country because they allowed local fishermen to enter the pelagic longline fishery with minimal capital investment. A few U.S. longliners operated from Grenada in the late 1980s. Most fishermen have since switched to U.S.-style monofilament gear. The Japanese Government provided small purpose-built fiberglass longliners to Grenadian fishermen in 1991 as part of a larger fisheries development assistance program. These donated vessels along with other local longliners, now comprise the backbone of the island's commercial fishing fleet. Grenadian longline fishermen primarily target tuna. Yellowfin catches and exports have increased substantially. Although the tuna fishery peaked in the mid-1990s a very good catch was reported in 1999. The swordfish catch has been much more limited, but increased results have been reported in recent years, apparently because of changing fishing strategy. The 1999 catch exceeded 40 tons and the 2000 catch may have been even larger. More substantial quantities of billfish are taken--especially sailfish which local fishermen call "ocean gar". Both marlin and sailfish are popular species with Grenada consumers. Some companies stopped exporting swordfish to the United States, because shipments were detained--causing substantial losses. Interest in swordfish appears to be increasing. Companies in recent years have continued or initiated shipments. Two exporters have qualified for an exemption to the U.S. Food and Drug Administration automatic swordfish detention requirement. Fishermen have added several larger longliners to the fleet. Changes in fishing strategy facilitated by Japanese advisers are enabling Grenadian fishermen to increase swordfish catches. U.S. import data suggests that Grenadian swordfish catches in 2000 may have exceeded 50 tons. There does not appear, however, any major effort at present to significantly expand the existing longline fleet.

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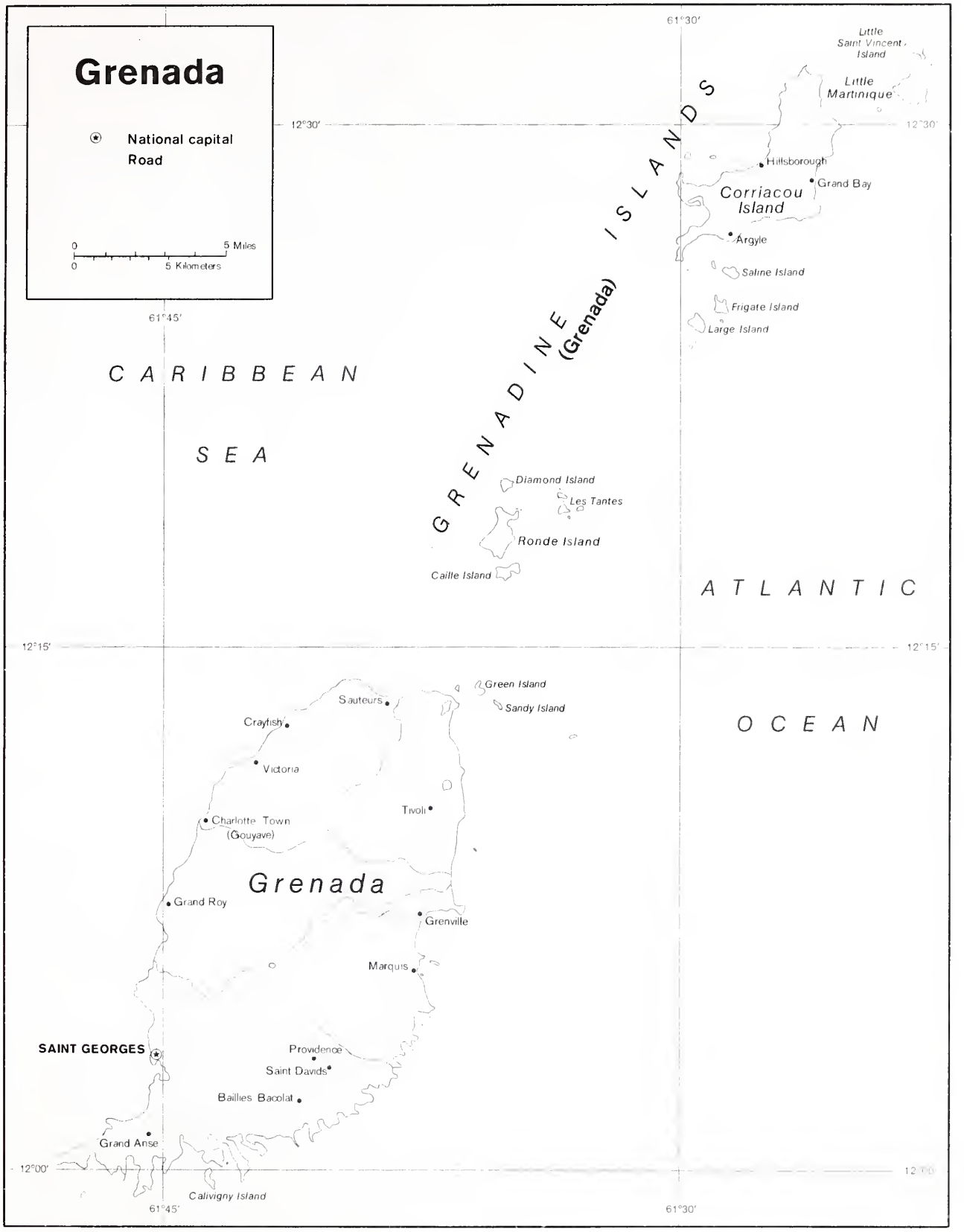


Figure 1.--Map of Grenada

Photo 1.--Grenada is known as the "Spice Islands". It not only has spectacularly beautiful scenery, but a highly productive agricultural sector. Dennis Weidner

I. Overview

A. General

Grenada and its indigenous population was largely undisturbed by Europeans in the 16th century. It was not colonized until about 1650 when a French expedition from Martinique purchased extensive land from the island's indigenous Carib Indians. Grenada eventually passed into British hands. The island has had a more turbulent recent history than most of the small Caribbean island states. The island became an Associated State as part of the West Indies Federation in 1967. Grenada achieved independence within the Commonwealth in 1974. The Constitution, however, was suspended in 1979 following a revolution which resulted in the establishment of the People's Revolutionary Government (PRG) led by Maurice Bishop. Close relations were established with Cuba which initiated an aid program, including a fisheries component. The Grenadian Revolutionary Government, following the Cuban model, attempted to suppress civil liberties. Disorders in 1983 culminated with the execution of Prime Minister Bishop by hard-core Marxists. This caused a group of Caribbean states to request U.S. assistance in restoring order. An interim government subsequently reinstated the Westminster-style parliamentary system as provided for in the Constitution. The British Crown appoints a Governor General. The legislature has a popularly elected House of Representatives and an appointed Senate.

Grenada is the southerly-most situated Windward island of the Lesser Antilles. It is located south of St. Vincent and north of the coast of eastern Venezuela

Photo 2.--Artisanal fishermen moor their semi-decked pirogues at the Careange, right in the heart of St. George's--the capital of Grenada. Dennis Weidner

Photo 3.--Grenadian artisanal fishermen land a wide range of species like these needlefish for sale in a market. Few species are discarded by artisanal fishermen. Mark Farber

and Trinidad. Grenada also includes the small islands of the Southern Grenadines, Carriacou, and Petit Martinique. Some of the Grenadian fishermen and many of the most skilled shipwrights come from these small islands.[1] The rest of the Grenadines are part of St. Vincent.

B. Fishing industry

The Grenadian fishing industry has fluctuated significantly from a high of nearly 3,000 metric tons in 1977 to a low of 700 t in 1981. The low 1981 catch is probably related to the disorders associated with the left-wing Government of Maurice Bishop than any resource problem. More recently catches have ranged from 1,300 t (1996) to 2,100 t (1992), quite a wide range. The 1999 catch was 1,600 t (appendix C1). Most of the catch is made up of pelagic species, usually about 75 percent of the overall catch. The most important species are yellowfin tuna, sailfish (gar), blackfin tuna, and dorado (dolphin fish) (appendix C2). While the catch is primarily pelagic, the island's relatively large shelf does provide an important demersal catch as well.[2]

Fishing operations have been characterized by artisanal fishermen using small boats and traditional gear and a simple marketing structure with virtually no value added processing. CARICOM estimates that there are about 1,240 fishermen, over 80 percent full-time. The fishermen have traditionally conducted four different fisheries: 1) oceanic pelagic, 2) beach seine, 3) demersal shelf, and 4) diving for shellfish.[3] Unlike many Caribbean fisheries there is little trap (pot) fishing. The introduction of longlining to Grenada has had a substantial impact on the local industry. It has allowed the fishermen to increase the catch of more valuable oceanic pelagics like yellowfin tuna, which can be exported and is helping Grenada to move its fishing industry from a largely artisanal to a small-scale commercial fishery.

The fishing fleet in the mid-1990s consisted of about 735 vessels, about 75 percent of which were pirogues. The rest of the fleet consisted of longliners, double-enders, dories, launches, and a variety of other

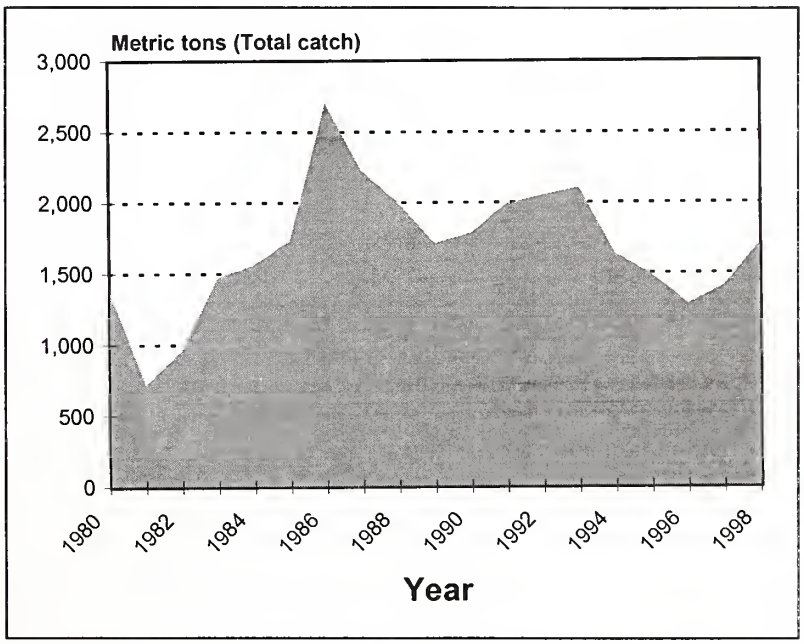


Figure 2.--The Grenadian fisheries catch has fluctuated significantly in recent years. The 1998 catch is well below peak levels in the 1980s and 90s.

Photo 4.--Grenada's fishing industry has been greatly expanded in the 1980s and 90s by the addition of many small longliners which make up most of the island's commercial fishery. D. Weidner

types.[4] The boats are mostly small artisanal craft, but a number of small fiberglass (GRP) and wood hulled longliners constitute the principal commercial fishery.

The Grenadian fishing industry is highly seasonal. Demersal fisheries on coral reefs and banks are generally pursued from July through November which is referred to as "the bottom season". Pelagic fisheries are traditionally concentrated from December to June which is referred to as the "ocean season".[5] Grenada has both inshore and offshore pelagics and these species account for the bulk of the catch. The small and medium-sized inshore pelagics are highly seasonal.[6] The longliners have, to some extent, allowed fishermen to fish outside of the traditional seasons because they allow the fishermen to target other species, some of which are less seasonal than the inshore species.

Grenada's fishing industry makes only a small contribution to the national economy, less than 2 percent of gross domestic product (GDP). While small the industry provides an important social role in that it provides employment opportunities in many isolated areas with high unemployment rates. Many of the artisanal fishermen involved have few alternative employment options.[7]

There are five fish processing companies which do some exporting and about 50 vendors.[8] Seafood imports in the 1990s ranged from $1.3-2.5 million (Caribbean Overview, appendix F1a). Imports are mostly cured fish required to prepare traditional dishes. Lesser amounts of canned fish are also exported. Exports have varied more ranging from minimal levels to as much as $4.3 million (Caribbean Overview, appendix F1b). Exports are mostly fin fish--primarily yellowfin tuna.

Photo 5.--The Grenadian Government with Japanese assistance has built improved landing facilities, but artisanal fishermen still operate from many locations without any such facilities. M. Farber

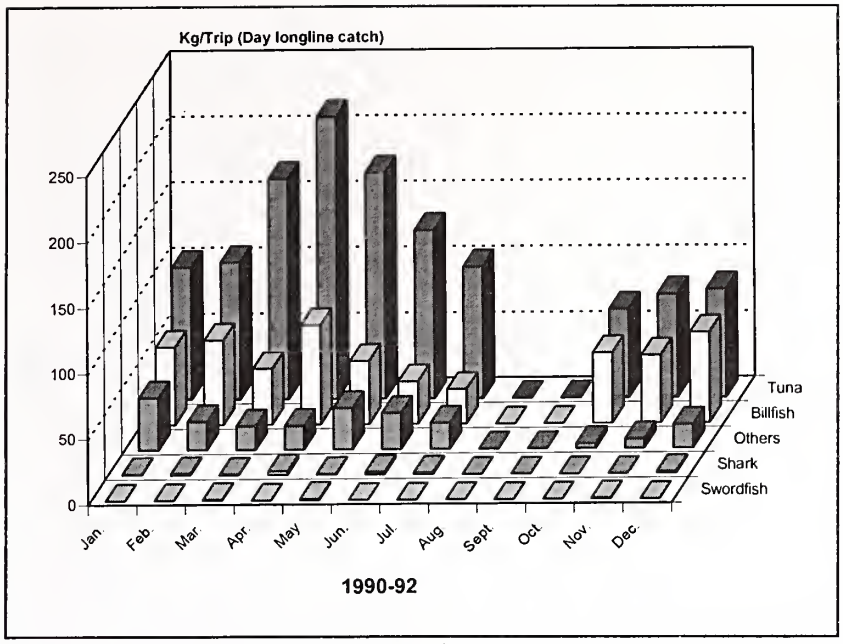


Figure 3.--The small Grenadian day longliners in 1990-92 rarely took swordfish and report highly seasonal catches for yellowfin tuna and billfish--mostly sailfish.

II. Species

The authors have been unable to find any studies describing swordfish behavior off Grenada. One report indicates that the fisheries for many large pelagics (tunas and sailfish) are highly seasonal, winding down during the hot summer months.[9]

A. Spawning

The spawning grounds for swordfish are primarily deduced by the location and abundance of swordfish larvae. One 1983 study reported that there is relatively little spawning within the Caribbean itself, although some limited spawning does take place south of Cuba. Considerable spawning activity is reported off western Cuba, both in the Yucatan and Florida straights (Cuba, figure 4). There is also some spawning around the Lesser Antilles, primarily from north of Anguilla to St. Lucia. Lesser concentrations of larvae were reported in the southern Lesser Antilles. There was, however, a notable concentration to the east of Grenada and northeast of Trinidad. The larvae found in the Lesser Antilles are both small and large sized. The lesser numbers of small larvae suggest that spawning is less intense than in the western Caribbean off Cuba. The numbers of large larvae suggest that spawned larvae are retained there or recruited from adjacent regions.[10] A 1998 analysis shows a similar pattern of larval concentrations in the Gulf of Mexico and U.S. southeastern coast, but some more limited concentrations off the northern islands in the Lesser Antilles (Venezuela, figure 10).[11]

B. Seasonality

The primary billfish taken by Grenadian fishermen is sailfish. Landings are highest from December to March and then rise again in May and June. There is, however, considerable variation from month to month. Fishermen also take small quantities of marlin which like sailfish have distinct seasonal peaks, although considerable variation can occur during any given year.[12] The seasonality could represent movement of the fish back and forth from summer feeding grounds off the U.S. coast. Available tagging data support this interpretation.[13] Other possible factors which could be causing seasonal catch fluctuations include local environmental variability, such as the freshwater outflow from the Orinoco River.[14]

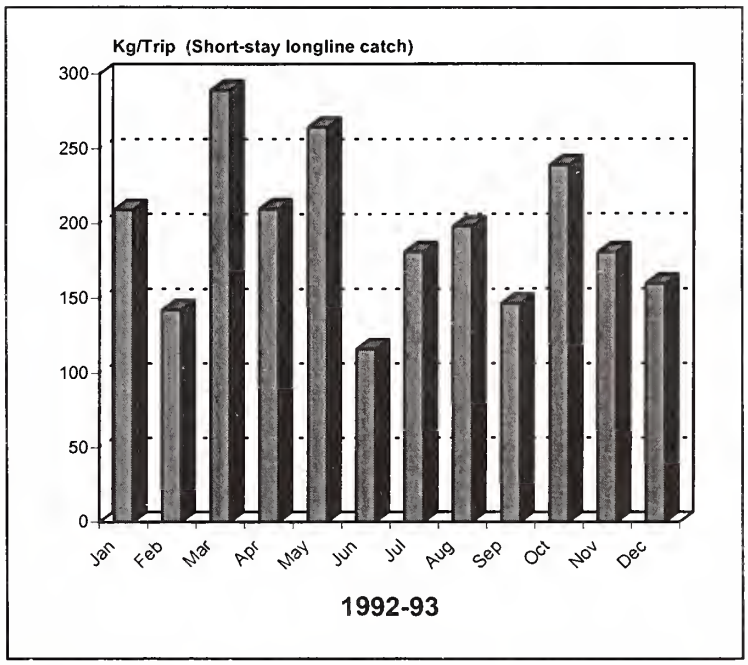


Figure 4.--The Grenadian short-stay longliners in 1992-93 reported much less seasonal overall results than the day longliners.

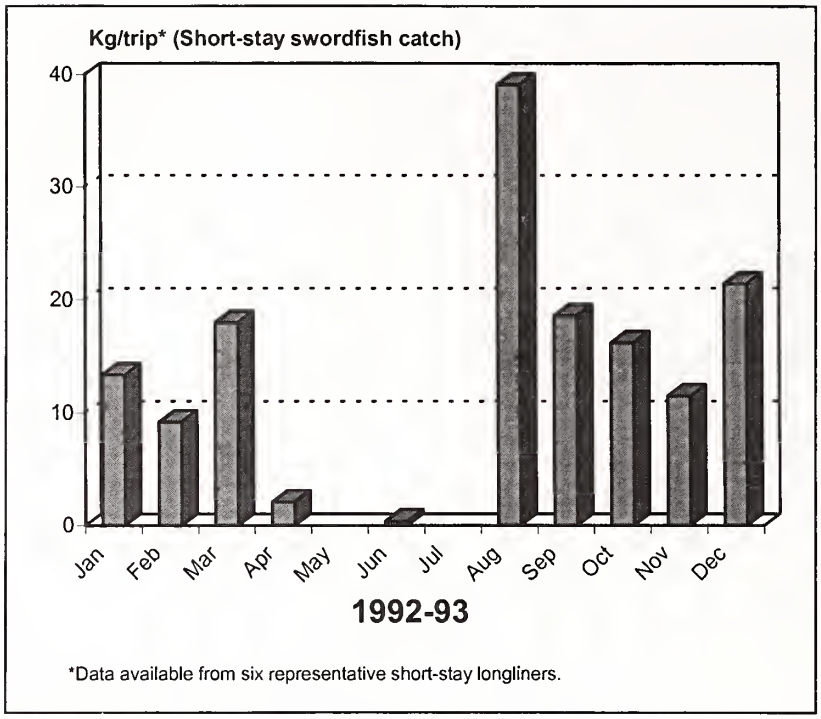


Figure 5.--Grenadian short-stay longliners in 1992-93 reported highly seasonal swordfish catches, mostly in the second half of the year with August the peak month.

Only limited seasonal catch data for swordfish is available from Grenadian longliners.

Day longliners: Small Grenadian longliners reported very seasonal catches of tuna and billfish (mostly sailfish), but virtually no swordfish (appendix B2).

Short-stay longliners: Data from six longliners operating from April 1992 to March 1993 show highly seasonal swordfish catches, although it should be noted that catches were small and swordfish were not the target species. Catches peaked in August and continued at lower levels through March. Catches dropped precipitously in April and continued to be very low or nil through July (appendix B3).[15] This pattern is similar to that reported by Barbados longliners in the early 1990s (Barbados, appendix B7 series). The overall catch of the short-stay longliners was much less seasonal than the day longliners, reflecting their greater range and adaptability.

U.S. imports of fresh swordfish can offer some insights on seasonality. As fresh swordfish is highly perishable, product is shipped within a limited number of days after landing. The quantities involved from Grenada through 1999, however, were so small that this data has only limited utility. U.S. imports show some seasonality. Since 1994 imports have been in the fall, winter, and spring months. Shipments from 1995-99 were almost entirely in the first half of the year. In earlier years, however, there were also shipments during the summer (appendix D2b). A similar pattern is noted in shipments from neighboring countries (Barbados, appendix E2c; St. Vincent, appendix C3b; Trinidad, appendix E2c, and Venezuela, appendix F2e). Grenada exporters in March 2000 began regular shipments of swordfish, the bulk of which have been in the last half of the year. The absence of swordfish shipments in January and February is probably due to the fact that new fishing strategies had not yet been implemented. Shipments reached 5.6 t in October 2000, more than Grenada has reported in most years. This data appears to reflect changing fishing strategies and an increased effort on swordfish which is not at this time readily comparable to previous years.

Some caution is necessary in using the assessment here of the seasonality of the Grenadian pelagic fishery. We have based the assessment on available data from the fishery, both catch data and U.S. import

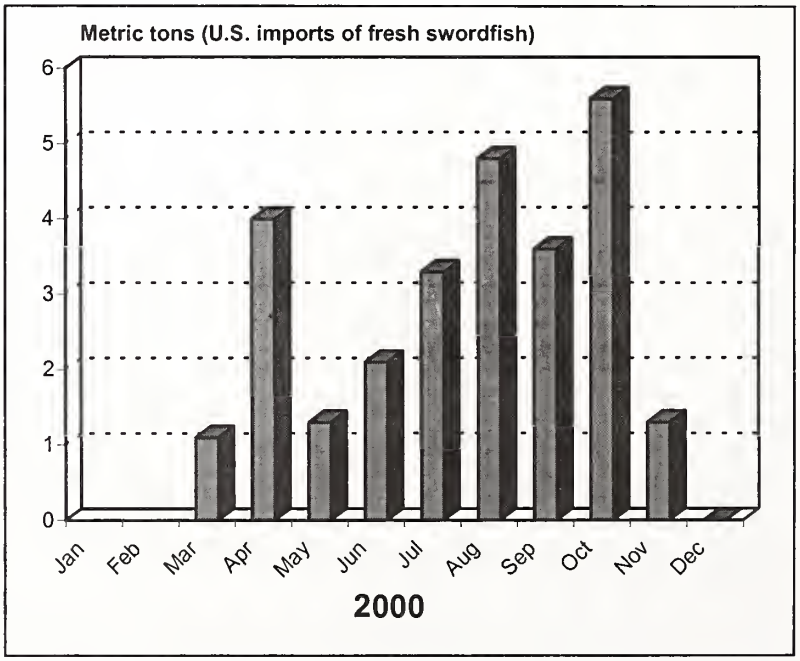


Figure 6.--Grenadian longline fishermen in March 2000 began reporting regular shipments to the United States. Conclusions on seasonal patterns, however are not yet possible.

Photo 6.--Some caution is necessary in using seasonality data based on catch data as it will be affected by the size and range of vessels deployed in the fishery. Dennis Weidner

data. We have done this because it is the data available to us. There are, however, a variety of limitations in using fishery based data for such assessments. Fisheries data can fluctuate vary according to a variety of variables that have nothing to do with seasonality, such as fishing strategy, technology, vessel size and deployment, market trends, and other factors. Thus the reader should use the data presented here with some caution.

C. Migration

The authors have little information about migratory movement of swordfish immediately around Grenada. Swordfish have been tagged and recovered in the northeastern Caribbean south of Puerto Rico and the Virgin Islands within the Antillian Arc and north and east of the Lesser Antilles out into the Atlantic. The fish appear to be moving seasonally up to rich feeding grounds off New England and Canada and then returning back to the Wider-Caribbean to spawn. (See "Caribbean Overview" and Caribbean Overview, appendix C3.) Swordfish are believed to mature in the theorized nursery area of the southeastern Caribbean west of Grenada and north of Venezuela.[16] Some limited tag returns provide tantalizing clues as to possible swordfish behavior west of Grenada. (For information on swordfish behavior east of Grenada, see the Barbados chapter of this report.) There have been some limited tag results suggesting a resident population of swordfish in this general area (Caribbean Overview, appendix C3). This would tend to confirm the theorized nursery area. As swordfish mature, they are believed to move west and follow the Gulf Stream north to feed seasonally off New England and Canada. There have been, however, a small number of tag returns from within the Caribbean suggesting that this may be the case (Dominican Republic, figure 3). The authors stress, however, that the tagging evidence at this time is too limited to draw any definitive conclusions.

D. Sizes

FD researchers report that swordfish longline catches off Grenada include a wide range of sizes.[17] This suggests that a range of year classes are present. Detailed size and age data, however, are not available. Such data would provide helpful data to help assess the possibility of a nursery area in the southeastern Caribbean as well as migratory movement.

III. Grounds

The physical and oceanographic conditions in Grenada create some of the best conditions for fishermen in the eastern Caribbean.

A. Topography

Grenada is the most southerly island of the Windward Islands. The country's main island is Grenada itself. It has lush, green volcanic mountains fringed with many beaches all around the island. The island's central mountain spine rises to 840 meters (m) at Mt. St. Catherine. The eastern coast faces the Atlantic Ocean and sea conditions can be rough. Grenada does not have an extensive 200-mile EEZ projecting out into the Atlantic because Barbados is located to the northeast and Tobago to the southeast. Along the east coast are many fringing banks and coral reefs. The more placid western coast extends out into the Caribbean. There are fewer reefs along the western coast and the bottom falls away steeply into the deep water of the Grenada Basin.

The Grenadian coast has three basic sectors with sharply different conditions.

West: The western or leeward coast from David Point south to Saline Point is relatively straight and undented with calm sea conditions. The entire western coast offers nearly ideal conditions for fishermen. Much of the fishing industry is located along the western coast where the fishermen benefit from protection against the dominate winds, a slight swell, and calm sea conditions. A steep fall off to deep water offer the fisherman access to pelagic resources. There are no fringing reefs. A good road parallel to the beaches offer relatively east access
to markets.

South: The shoreline along the southern and southeastern coast between Saline Point and Grenville is irregular and deeply indented. There are several excellent natural harbors. There are some dispersed shallows and reefs, but access to the sea is easy. Beaches are, however, located at some distance from the main road and connecting roads are in many cases unimproved.

East: The straight and unprotected eastern or windward coast experiences a nearly constant easterly swell. The coast is fringed by coral reefs with heavy breakers. The only port of importance is Grenville. Access to the sea is possible through a narrow channel across coral reefs.[18]

North: The configuration of Grenada gives it only a small northern coast. It is off this coast and around the islands like Carriacou and Petit Martinique to the north of Grenada, however, that much of the shallow water shelf area offering demersal resources is located.

The country's jurisdiction extends to the southern Grenadines located to the north of the main island. The principal islands in the southern Grenadines are Carriacou and Petit Martinique. The water around these islands is relatively shallow compared to the deeper water to the east and west.

Photo 7.--Grenada is a lush hilly island. The eastern coast faces the often rough Atlantic, but there are many protective reefs. Dennis Weidner

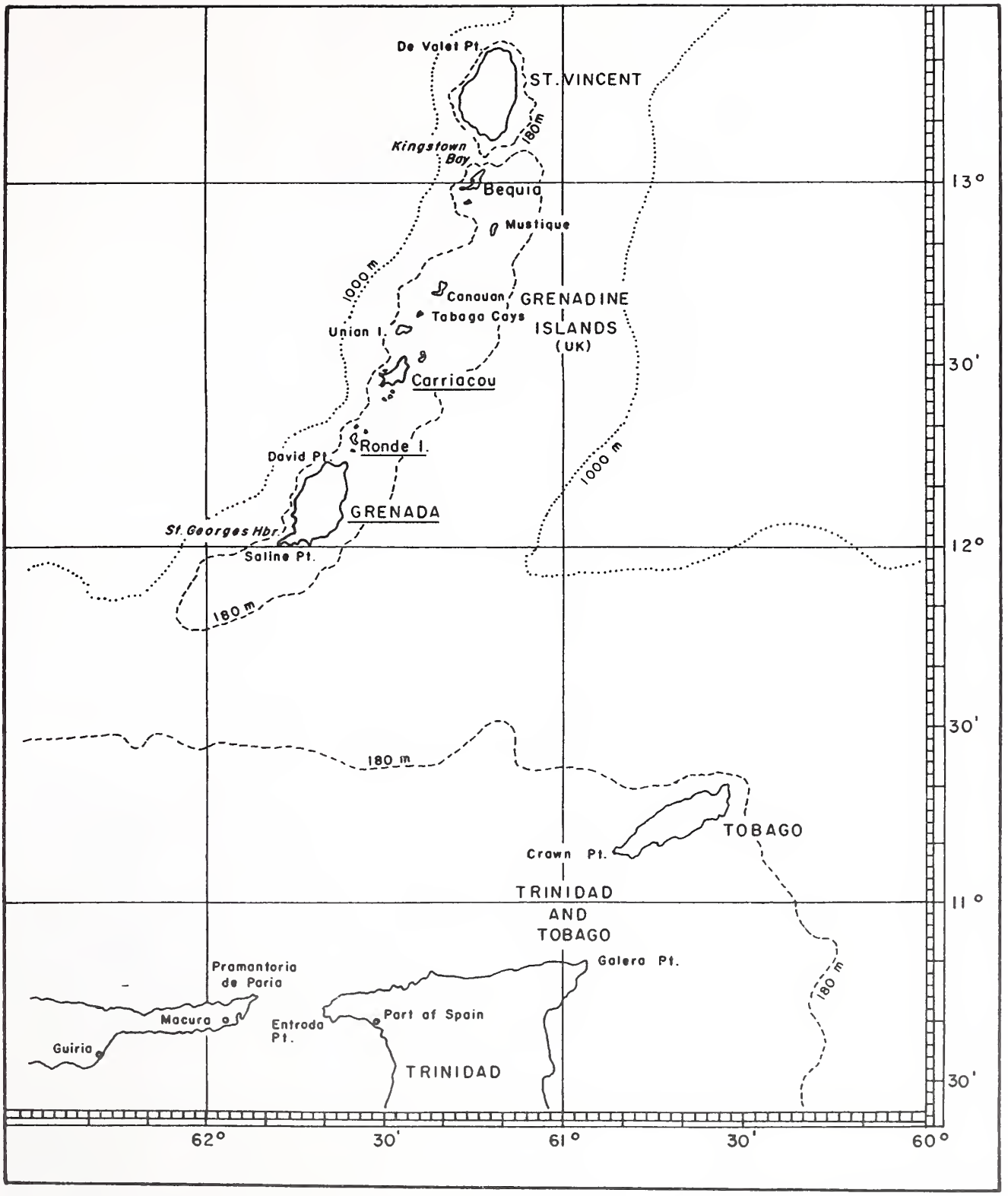


Figure 7.--Geographical location of Grenada and associated islands and offshore depths. Giudicelli

Photo 8.--Fishermen operating off Grenada's eastern coast face the usually much more tranquil sea conditions of the Caribbean. Dennis Weidner

Grenada is the southern terminus of the submarine still separating the Caribbean and Atlantic. The principal island to the south, Trinidad, is located on the South American shelf. The water between Grenada and the South American shelf Venezuela/Trinidad is not very deep, generally not deeper than 1,500 meters.

B. Oceanography

1. Currents

The dominant oceanographic feature off Grenada is the proximity of an important ocean current system. The Guyana Current (and/or North Brazilian Current) retroflection eddies are present most of the year (July through March) off Grenada.[19] The Guyana Current is an extension of the South Equatorial Current and is generally referred to as the Caribbean Current after it enters the Caribbean Sea.

The principal ocean current input into the Caribbean basin comes through the Lesser Antilles. Venezuelan researchers report that the main inflow into the Caribbean occurs between Dominica and St. Vincent (21.5 Sverdrups).[20] Other researchers report stronger current flow more to the south (Caribbean Overview, appendix B1).[21] NOAA in 1991-94 conducted 10 cruises during different seasons to assess the current structure and water-mass properties in the southern passages between the Caribbean and Atlantic from Dominica south to Trinidad. The flow is generally strong and stable at the surface, but the subsurface counterflow is strongest and most notable in the Grenada passage between Grenada and Trinidad and Tobago.[22] Researchers also note strong subsurface counterflows in the Grenada Passage.[23] One report suggests that more than half of the transport of water coming through the eastern Caribbean enters through the Grenada Passage. It is the greatest transport of water entering the Caribbean from the southern hemisphere.[24] Surface flows in the St. Vincent and Grenada Passage are 40-60 km/sec with maximum observed currents of 90 cm/sec.[25]

The Caribbean Current is predominantly an extension of the Guyana Current and/or of the water advected northward once the North Brazilian Current retroflection eddies disintegrate at the 1,000-m ridge between Tobago and Barbados. Further north in the Caribbean Sea the North Equatorial Current has an increasing influence.[26] This current system is not nearly as strong as other currents, like the Peru, Malvinas, or Brazil Currents off other South American countries. In fact, there are occasional flow reversals to the normal westerly patterns of the Caribbean Current. Eastward flows are occasionally encountered instead of the predominantly westward current in the Grenada and Venezuelan basins. Observations on the Aves Ridge, running north from Margarita Island to Isla Aves, have shown intermittent easterly flow of variable strength around 13°N. This flow eventually leaves the Caribbean Sea and enters the Atlantic Ocean as the Caribbean Counter Current to the north of Grenada around St. Lucia and St. Vincent.[27]

2. Winds

An additional feature off Grenada is the wind regime which plays an important role in the Caribbean and Atlantic. In the Caribbean, the winds mostly blow along the coast (parallel to the shore), whereas in the Atlantic, the winds are predominantly blowing onto the coast. Further west, the winds along Venezuela's Caribbean coast help to form an upwelling system.[28] This upwelling supports fodder stocks for oceanic pelagics.

3. Basins

There are various deep basins within the Caribbean Sea such as the Yucatan, Cayman, Colombian, Venezuelan, and Grenada basins. The Grenada basin is the smallest and most shallow of the five basins which make up the Caribbean. Most if the basin has water of 3,000-3,200 m in depth, but there is a small area northwest of Grenada with water as deep as 4,100 meters.[29] Grenada itself is located at the southeastern corner of the basin and much of the Grenada longline fishery takes place in the southern periphery of the Grenada Basin. Outside of the Caribbean in the Atlantic there is the smaller Tobago basin located between Grenada/St. Vincent and Barbados.

4. Colder water intrusion

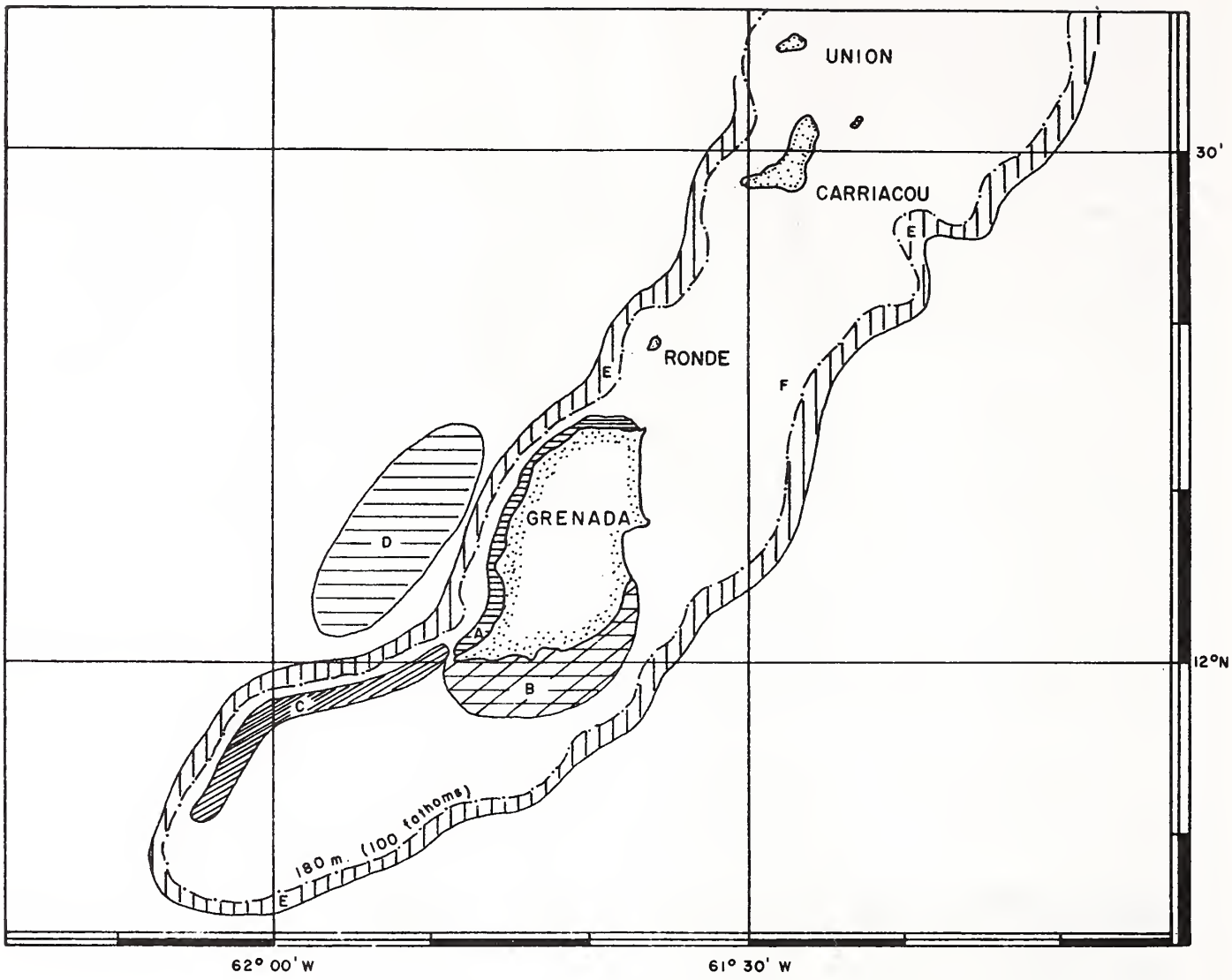
The Caribbean basins are constantly being filled with water coming mainly from the southern Sargasso Sea that moves into the Caribbean Sea through various passages such as the Windward passage, located between Cuba and Haiti, and the Anegada (Jungfern) passage, located near Puerto Rico between the U.S. and British Virgin Islands. Water from different depths and thus temperatures move into the Caribbean through these passages, primarily deep Atlantic water and central water formed in the Sargasso Sea.[30]

The introduction of these relatively cold masses of water in the warmer Caribbean creates favorable conditions for oceanic pelagics like swordfish. Swordfish are known to concentrate in areas with temperature fronts or at the boundaries between different water masses with different temperatures. Such conditions are in part created by the topography of the Venezuelan basin, which extends as far south as 12°S (about 175 km north of Venezuela's central coast and only about 25-50 km north of Los Roques, Orchila, and La Blanquilla island). The presence of the relatively cold water masses entering the Venezuelan basin so close to warmer and shallower coastal waters help to create favorable conditions for swordfish. Most of the Venezuelan swordfish catch is taken north of the Venezuelan offshore islands.[31] The authors believe that it is the presence of such water temperature gradients in the Venezuelan Basin, just north of the Venezuelan offshore islands, which may make these grounds very productive for swordfish, billfish, and tuna operations.

C. Fishing grounds

Grenada has a long tradition of artisanal fishing and offers relatively good conditions for those fishermen. The country lies in the northeast trade wind system of the North Atlantic, with winds from north or northeast prevailing most of the year. Winds are generally moderate and hurricanes less of a problem than for many other Caribbean islands to the north. The country is located near the northern tip of the South American continent. The waters around Grenada are dominated by a strong flow of relatively productive Atlantic water entering the Caribbean.[32] Grenada and its smaller island partners (Carriacou and Petit Martinique) also have relatively important shelf areas.

Photo 9.--These artisanal fishermen south of Gouyave along Grenada's Caribbean coast are mending their nets. Note the whaler-type boat in the foreground. Dennis Weidner



Zone A .- Beach-seining and encircling gill netting, all year.

Zone B .- Lobster and conch diving.

Zone C .- Bottom hand lining ("Bank fishing"), June to December.

Zone D .- Combined scoop and surface and line fishing ("Ocean fishing"), November to June.

Zone E .- Trolling along and outside the drop - off, November to June.

Zone F .- Trolling along and outside the drop - off, June to December.

Figure 8.--Type, distribution and seasonality of Grenadian artisanal fishing. Giudicelli

Grenada's artisanal fishermen conduct operations on several different grounds. The fishermen conduct fisheries in coastal waters at depths of 9-70 meters.[33]

Ocean pelagic: Surface and line ocean fishing is conducted off the western coast beyond the shelf slope. Trolling is conducted on the shelf slope.[34]

Demersal bank fishing: Bottom hand lines are deployed along the shelf slope, southwest of Grenada.

Photo 10.--Artisanal fishermen still use beach seines, mostly along the Caribbean coast. Dennis Weidner

Beach seine: Beach seines and encircling gillnets are deployed in inlets and coves, mostly along the western coast. Grenadians commonly refer to these beach seines as purse seines. Although primarily after edible fish for the fresh food market, these fishermen also supply bait to the longline fishermen.[35]

Shellfish diving: Divers gather shellfish mostly along the southern coast.[36]

Longlining: The Grenadian artisanal longliners operate relatively close to the coast. Most of the longlining is conducted off the western coast. Some fishing takes place only about 2 km offshore as the shelf is very narrow. Off the eastern coast where the shelf is wider, longline fishermen can begin setting about 6 km off the coast.[37] One observer notes that the fishermen in recent years have been fishing at greater distances from the island as catch rates immediately around the island have declined. Longline fishermen used to commonly fish relatively close to the island (40-60 km), but now commonly operate out to as much as 125 km offshore. Others do not deploy their boats as much as in the past.[38] Most of the longlining is conducted off the western coast within about 250 km of St. George's, but as some fishermen move north off the coast they are relatively close to the coast. One longline captain described operations about 100 km from St. George's.[39] This is fairly standard for the fleet. The great bulk of the longliners operate within about 120 km of St. George's. The declining fleet of pirogues operate even closer to the coast,

Photo 11.--The best recreational ground are to the northeast of the island, but some recreational fishermen report good results on grounds off the western coast close to St. George's. D. Weidner

Photo 12.--Grenada's longline fleet has significantly expanded the grounds which can be targeted. Most of the longliners, however, still only make short trips. Dennis Weidner

usually within about 50 kilometers.

Recreational: Recreational fishermen report that the most productive fishing areas are off the Atlantic or eastern coast, especially the shallow areas to the northeast of the island. These ground, however, are located at some distance from St. George's. There is also some good fishing off the Caribbean or western coast, sometimes very near St. George's. Off the west coast depths fall off rapidly. At Reindeer Shoal, depth drop from 10 to over 300 m offering a range of species to target.[40] This varied habitat means that a variety of species can be targeted by the local anglers.

The authors know of no studies assessing the relationship between swordfish and oceanographic factors off Grenada. As Grenada is located at the southeastern periphery of the Caribbean, information available on the southern Caribbean generally may have some relevance. Some work is available on the relationship of oceanographic conditions and tuna behavior in the southern Caribbean that may have some relevance to swordfish. Most of the Caribbean tuna catch is reported in the southern area of the Caribbean along the Venezuelan coast, probably because of the hydrographic conditions. The Venezuelan fishery takes place primarily around 12°N, comparable to the northern coast of Grenada. At this latitude further west off Venezuela there are several offshore archipelagoes and the thermocline deepens significantly. Upwelling caused by the westward flowing currents also affects the tuna catch.[41]

Photo 13.--A wide variety of vessels have been rigged for longlining in Grenada. Even this schooner has been rigged with longline gear. It is moored at the Carenage in St. George's. D. Weidner

Photo 14.--Traditional wooden boats like these are rapidly disappearing from Grenada's artisanal fishery. Dennis Weidner

IV. Fleet

Grenada has one of the largest fishing fleets of the small eastern Caribbean island countries. Until longlining was initiated, fishing was primarily artisanal and conducted in coastal waters (figure 8). As recently as the 1970s, large numbers of artisanal boats were still powered by sails or even oars.[42] Since acquiring longliners, the fishermen have significantly expanded the range of the island's fishery.

The authors have noted varying estimates of the Grenadian fleet over time. Several authors have estimated a fleet of approximately 700-750 craft with about 1,500-1,800 fishermen.[43] The one published census known to the authors, however, noted less than 500 craft in 1983. Following fleet trends in Grenada is somewhat complicated by the tendency of the FD and other observers to use varying terms to describe the same vessel type.

Several different authors have described fleet developments over time:

Late 1970s: An FAO fisheries specialist in 1978 reported that about 1,800 fishermen were operating about 700 sail-powered and motorized craft. The "backbone" of the fleet was the traditional wooden whaler (appendix A1a).[44]

Early 1980s: Grenadian fishermen as a result of the Cuban aid mission began rigging a variety of boats for longlining. The Cubans donated several ferro-cement boats, four of which were used for longlining.

1983: One 1983 report indicated the artisanal fleet consists of about 280 powered boats,

Photo 15.--Artisanal fishermen have now mostly turned to sleek pirogues like these which they operate with large outboards. Dennis Weidner

including 46 boats (8-12 m) with inboard motors and 236 smaller boats (5-7 m) with outboard motors.[45] A 1993 report suggested that there were about 350 boats, mostly 6-10 m long (appendix A1b).[46]

Mid 1980s: U.S. longline fishermen expressed an interest in operating from Grenada.[47] A few U.S. longliners did operate from Grenada beginning in the mid-1980s. Their operations using monofilament created added interest in longlining. This caused several more Grenadian fishermen to acquire small longliners. Grenadian longline fishermen quickly shifted to U.S. monofilament gear.

Photo 16.--This artisanal fiberglass pirogue has fitted with a small longline. Note the hand crank on the reel and the powerful twin Japanese outboards. Mark Farber

1988: The DF estimated that there were about 635 fishing craft.[48]

Early 1990s: Japan donated eight 11-m GRP fiberglass longliners to the Grenada Government.

1996: A more recent report indicated that the fleet totaled about 700 boats as of early 1996. The fleet in 1996 ranged from 4.3-13.7 m, but most of the boats were on the smaller side of the range.[49]

1999: Grenadian officials in 1999 indicated that the fleet was primarily composed of boats averaging about 8 meters.[50]

Late 1990s: A CARICOM 1999 internet posting reported a fleet of 735 craft dominated by fiberglass pirogues. About 575 pirogues were active or nearly 80 percent of the fleet. CARICOM noted 4 fiberglass longliners (appendix A1c).[51] This is, however, a low estimate because the authors noted many more fiberglass longliners than that during a 1999 visit.

A. Artisanal

The artisanal fishermen use a wide variety of craft.

Whalers: The most common type of artisanal craft in Grenada's traditional artisanal fleet was a whaler (6.0-10.5 m), open planked boats. They were originally sail powered, but by the 1970s many had been equipped with small outboards.[52]

Artisanal pirogues: Sleek fiberglass pirogues have generally replaced whalers in the Grenadian fishery. Estimates as to the actual number of pirogues, however, varies. FD sources indicated that fishermen in 1999 operated over 200 pirogues, small open or semi-decked boats about 5-7 m long.[53] A CARICOM report, however, estimated that there were about 575 pirogues (appendix A1c).[54] While the pirogue has come to dominate the local fishery, one source indicates that disappointing earnings has caused some fishermen to cease operations. One local observer reports that the number of pirogue fishermen has been declining in recent years.[55]

Longliners: The authors have been unable to obtain precise information on the number of small longliners operated by artisanal fishermen. In some cases a fishermen has simply put a small longline reel on a basic pirogue. One source indicated that the grenadian fishermen deploy about 90 small longliners (7.9-9.7 m).[56] This estimate appears to include both artisanal craft and the small longliners deployed by commercial fishermen. The authors have received estimates from varying sources that there are about 30-40 small undecked artisanal craft rigged with longlines (appendix A2).

Other types: The rest of the fleet is mostly (3-6 m) canoes, transumers, and sloops. There were also more than 200 unpowered boats in the early 1980s, using both sail and oars.[57] A more recent report indicated that most of the artisanal fishermen were operating boats, 6-8 m in length and equipped with outboard motors (25 horsepower or larger).[58]

Photo 17.--Space is at a premium to store gear on Grenada's relatively small longliners. This longliner works with Caribbean seafood. Dennis Weidner

Catamaran: FAO brought a Norwegian boat builder to Grenada to design and build a catamaran as a possible prototype for island fishermen. The catamaran was built in 1990. It proved to be a useful craft for trolling off Grenada's calmer Caribbean leeward coast. It was not stable enough, however, for productive longlining off the rougher Atlantic windward coast of the island. The catamaran was redesigned by adding a higher freeboard and installing two rather than one 80 hp outboard motors. The redesigned catamaran proved quite successful in trial sets. The Fisheries Department reports catches from this one craft exceeding the entire Grenadian commercial fleet. Unfortunately a storm in 1991 tore the catamaran from its anchor and wrecked it ashore. The construction cost (about $45,000) was more than most eastern Caribbean artisanal fishermen could afford so this vessel type was not adopted by the local fishermen.[59]

Fishermen operating small wooden and fiberglass boats have reportedly been devoting increasing attention to maintaining the quality of their catch. Merchants are reportedly increasingly basing prices on product quality. As a result, more fishermen are installing ice boxes on their boats.[60]

B. Commercial

1. Schooners

Grenadian fishermen operate 9-12 m schooners with ice holds. The vessels are deployed in coastal waters, primarily for demersal species.[61] At least one schooner, however, has been rigged for longlining.

2. Longliners

The authors have noted a variety of references to the number of longliners operated by Grenadian fishermen. The larger numbers probably include the artisanal pirogues. Government sources suggest that the fleet of decked vessels deploying pelagic longlines probably totals about 30-40 decked vessels and a comparable number of undecked vessels.

Semi-commercial longliners: One 1993 report indicated that the Grenadian fleet consisted of the 8 Japanese-donated longliners, 6 locally-owned longliners, and 14 small longliners. Grenadian officials reported in the late 1990s that fishermen operated about 30-40 decked longliners and perhaps another 30-40 undecked vessels which deployed longlines. Only limited information is available on the vessels involved (appendix A2). This does not include the large number of small pirogues which may deploy longline gear.[62] Most of the Grenada longliners are owned by the captains that operate them.[63] The vessels have ice wells and are generally 10-13 m long. The authors have received various descriptions of these longliners. A recent report from the Grenadian Government describes the longliners as mostly ranging from 11.2-13.7 meters. Grenadian officials in 1999 report that the longline vessels ranged from about 9 to 15 meters, many of which were 12 m long.[64] They include vessels built locally and imported from the United States and Japan. The locally-built vessels have wood hulls while the imported vessels are mostly GRP. Some Cuban-built ferro-cement boats were active in the early 1980s, but are no longer in use.

Commercial longliners: The authors know of no large, commercial longliners in the Grenadian fleet.[65] While there are no large longliners, Grenada does have several medium-sized longliners that would probably be better classified as small commercial vessels. In

Photo 18.--Grenadian fishermen deploy a wide range of vessels in the longline fishery. Many of the Grenadian longliners have extremely limited ranges. D. Weidner

Photo 19.--Many Grenadian longliners do not have bow and or stern markings as to the home port and name of the boat. Dennis Weidner

the absence of a detailed fleet list, however, it is difficult to classify the Grenadian fleet.

The Grenadian longliners have been built locally as well as imported from various foreign countries. Most of the Grenadian longliners are relatively small vessels, most ranging from 11-14 m, but there are also a few slightly larger longliners.

Local construction: Most of the wooden hulls are locally built boats. (See "Shipyards".)

Barbados: The authors have reports of some imported vessels from Barbados, but few details.

Cuba: Cuba in the early 1980s provided 8-13 (accounts vary) 17-m ferro-cement boats as part of its aid program.[66] The first was to serve as a research vessel. The others were initially operated by NFC, the state fishing company. The authors have received various reports on the vessels. Some say the vessels were not very effective. Other say that the vessels were useful and suitable for fishing technology appropriate to the Grenadian fishermen.[67] The vessels were not mechanized and used boxes of line rather than a hydraulic reel. The vessels were sold to private owners in the mid-1980s who stripped them of their gear and equipment and abandoned them at various locations along the coast.[68] This suggests that perhaps they were not well suited for longlining. Another observer suggests that after U.S. intervention in 1983, there was a general desire to discard everything associated with the Cubans.

Japan: The Japanese Government working with NFC/GCFL donated eight new 11-m GRP longliners to Grenada in 1991.[69] The Grenadian Government offered the vessels to local fishermen for lease and/or purchase. One was retained by the FD for research

Photo 20.--The fiberglass longliners donated by the Japanese (the two vessels on the left) have made a major contribution to the Grenadian longline fishery. Dennis Weidner

Photo 21.--Most of the larger, newer additions to the Grenadian longline fleet are imports from the United States. Dennis Weidner

and other fisheries management purposes.[70] The vessels were reportedly activated in 1992.[71] One report indicated that the other seven vessels were sold to local fishermen in 1993.[72] Another 1993 report suggested that only five Japanese-built vessels were active.[73] At least some of the vessels are still active. The authors observed two of these vessels at St. George's in 1999. They are 11-m long with 7-t holds and carry a 16-km longline. They are operated by a crew of three.[74]

United States: Many of the older wooden hull Grenadian longliners are being replaced by fiberglass (GRP) vessels. Most of these new GRP vessels are imported from U.S. shipyards. Thus many of the newer vessels in the Grenadian longline fleet are U.S. imports.[75]

The Grenadian longline fleet appeared quite active during a 1999 visit by the authors. Only one vessel at the major ports appeared to be tied up inactive and even that vessel had some of the gear aboard. It was somewhat difficult to collect information on the fleet because the names were not painted on several vessels.

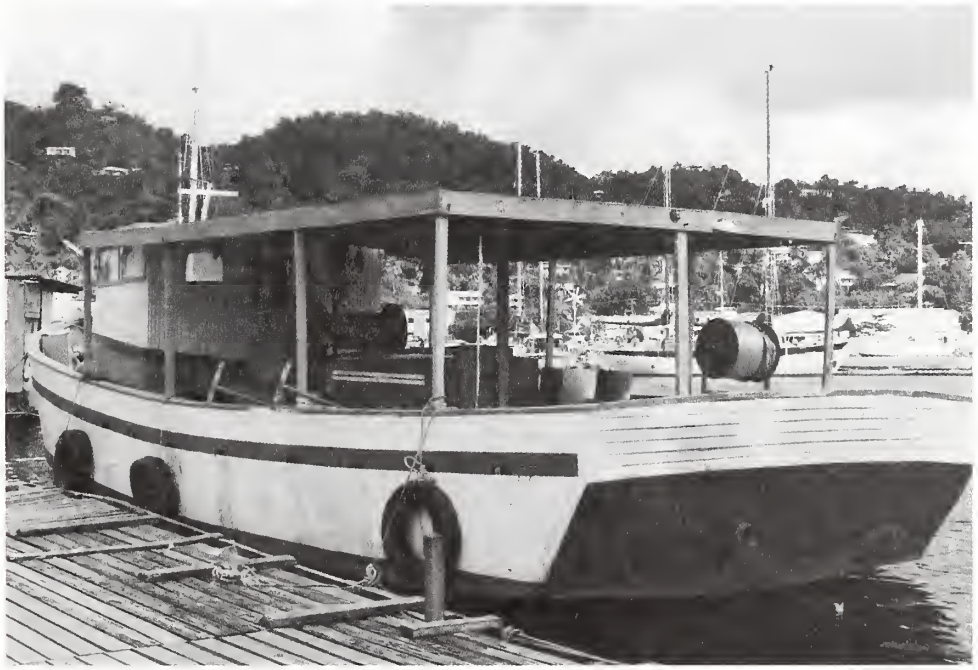


Photo 22.--This relatively large wooden longliner in St. George's was one of the few that did not look active in 1999. Note there was no name painted on the vessel. Dennis Weidner

Photo 23.--Many enthusiastic sport fishermen keep their boats at the Grenada Yacht Club. Dennis Weidner

C. Recreational

Grenadian recreational boats vary from basic motorized pirogues to top of the line sport fishing boats up to about 12-m in length. About 4 recreational charter boats are generally available in Grenada. Some of the charter boats active in the fishery are a Bertram 31 (*Wayward Wind*), a Bertram 35 (*Xiphias Seeker*), and a Bertram convertible (*Reel Affair II*). The Reel Affair II, for example, is 11.5 m long with two 320 HP engines which can run at 18-20 knots. Unlike the commercial fishermen, some of these boats are equipped with electronic fish finding equipment.[76] The boats target billfish and wahoo throughout the year. The best season, however, is during the winter months which works well for the tourist industry. An annual billfish tournament is held during January. About 40 vessels registered for the 1996 tournament.[77]

Photo 24.--Fishermen can have repairs made or, as for these two small longliners, rent the equipment and make their own repairs at several artisanal boat yards on the island. D. Weidner

motors. One local observer believes some of these local skills may in fact produce more cost efficient boats than the GRP pirogues now in vogue.[80]

Grenadian officials with FAO assistance funded the design and construction of a 11-m prototype catamaran, the *Carib Spirit*.[81] The vessel proved suitable for trolling on the calm, leeward (western) coast, but needed to be modified for longlining along the more productive windward coast. The FD using the modified vessel reported very successful longline operations, landing more tuna than the entire commercial fleet. A storm in 1991 tore the vessel from its anchorage and it was destroyed. The construction cost, however, proved too expensive for domestic fishermen. One source indicated that the catamarans might cost up to $100,000 each, although other sources provided lower estimates.

V. Shipyards

Grenada's traditional artisanal fleet is built locally by shipwrights skilled in constructing wooden vessels.[78] Generations of boys learned the skill of building boats at beach front operations from their fathers. White ceder was a preferred wood. Boat building was an important part of the local fishing industry. One 1981 estimate suggested that 50-60 small artisanal yards were located on Grenada and Carriacou.[79]

The traditional boat building industry has declined in recent years as many artisanal fishermen have shifted to fiberglass (GRP) boats with outboard

Photo 25.--The SS Boat Yard in St. George's advertises itself as "Your do it yourself boatyard". Dennis Weidner

Additional models of the prototype will probably not be built, primarily because of the higher than expected costs.

Grenada has no large shipyards capable of building commercial fishing vessels.[82] There are some small yards which will service artisanal boats or provide facilities for fishermen to work on their own boats. Grenada Marine is building a facility at Corinth along the southern coast. The Corinth facility in 1999 had 10 acres primarily servicing pleasure boats. A syncrolift can pull boats out of the water. The boats can be stowed ashore for extended periods or for servicing. Grenada Marine is already the largest such facility in Grenada. While the facility in 1999 was primarily servicing pleasure boats, plans exist to expand the operation. The owner hopes to eventually construct boats at his Corinth facility. Company managers are optimistic about the future for Grenada Mariner and the potential impact in the local community.[83]

Some of the first dedicated longliners currently in use were donated Japanese-built vessels.[84] A government official reports that a few smaller longliners have reportedly been constructed at a yard producing fiber-glass (GRP) boats which was built as part of a Japanese foreign aid program.[85] For the most part, however, the wood hull vessels in the fleet are locally built and the GRP boats are imported, mostly from the United States and Japan.[86] Some fishermen in recent year have been acquiring larger vessels. Several steel or GRP vessels have been imported from the United States. There have also been a few GRP vessels imported from Trinidad.[87]

Photo 26.--The acquisition of longline technology has had a major impact in the previously mostly artisanal Grenadian fishery, creating an increased demand for shipyard services. Mark Farber

Photo 27.--The new Grenada Marine facility at Cornith is the most modern ship servicing facility on Grenada. Olans calls for eventually constructing fishing and other vessels. Dennis Weidner

VI. Fleet Operations and Gear

Grenada has no large fishing companies operating large fleets of boats. The fishing industry has traditionally been a largely artisanal operation with fishermen deploying primarily lines. Grenadian officials, however, report that many fishermen about 1995 began shifting from artisanal fishing to larger-scale artisanal or small-scale commercial operations, especially longlining.[88] These vessels focus primarily on tunas and billfish--mostly sailfish. Most Grenadian fishing companies are primarily involved with marketing rather than fishing. Fishing vessels are generally owned by individuals. A few own two or three boats, but most own only one boat. Some vessels aren't owned by actual fishermen, but rather people who hire fishermen to operate their vessels. Other vessels are owned by fishermen who actually operate their own vessels.[89] The vessel is often operated as a family business with a fisherman's sons learning the trade by assisting his father on the boat.

A. Traditional fleet

1. Traditional fleet

Grenadian fishermen in the early 1980s fished primarily in coastal waters. Fishermen mostly deployed basic gear. Small pelagics were caught with beach seines and twine gillnets. Grenadian officials report that many traditional artisanal fishermen have primarily deployed simple handlines close to the coast. Some fishermen trolled for large pelagics between January and June. Despite the basic gear and methods large pelagics, especially yellowfin and skipjack, might comprise 20-25 percent of the catch.[90] Major changes in the fishery have been noted in the mid-1990s.[91] While handlining was by far the principal fishing method as late as the mid-1980s, many fishermen have since shifted to trolls and reels. A variety of other gear and methods are also employed. Small-scale artisanal fishermen operating from pirogues operate during the day, many leaving by about 10:00 am and returning by 2:00-3:00 pm the same day.[92]

Grenada artisanal fisheries has two distinct fishing seasons, the ocean season and bank fishing.[93]
Pelagic ocean season: The fishermen use a variety of gear, including seines and other encircling gear, gillnets, tangle nets, handlines, and trolls. Flyingfish is an important species taken in Barbados and other islands in the southeastern Caribbean like Grenada.[94] Grenadian fishermen employ a unique method of attracting flying fish by chumming and concentrating them to attract larger, more valuable species. The flying fish are then caught by scooping and the pelagics by hook-and-lines baited with the flying fish.[95] Some fishermen use fish-aggregating devices (FADs) constructed of natural materials when fishing for flying fish.[96] Trolling involves two bamboo poles and two or three surface lines with artificial lures or natural bait. The trolling catch includes the larger pelagic species, such as yellowfin and blackfin tuna, kingfish, and barracuda.[97] The most important is the ocean season which is normally conducted from October/November until May/June and primarily targets oceanic pelagics. Fishing during this period is relatively steady, although sometimes interrupted by bad weather. Fishermen report that the fish stop biting during May or June. The fish taken in the oceanic pelagic fishery constitute over half of the country's entire catch. Officials report that this fishery has been expanding and offers the most significant potential for expansion.[98] The fishermen mostly conduct day trips, leaving in the early morning and returning in the early afternoon. Fishermen operating a few sloops from Carriacou spend a few days at sea, preserving the fish with ice and marketing much of the catch in Martinique.[99]
Demersal bank/shelf fishing: The fishermen mostly use hook-and-line gear.[100] Bottom hand lines are the most common gear which are deployed at depths of 20-200 meters. There is also some spear fishing.[101] Some fishermen also have begun trolling for pelagics as they move to and from the grounds. The fishermen use boats from 4.5-6.0 m in length with reels deploying 30-50 hooks. Pelagic fishing focuses on wahoo, blackfin tuna, and dorado (dolphin fish).[102] Unlike most other Caribbean islands, there is little trap fishing in Grenada. As the ocean season tails off the fishermen along the eastern coast shift to demersal reef species (mostly snappers, hinds, parrotfish, and lobster), mostly on the slope of the shelf surrounding the islands. Many fishermen along the western coast suspend operations during this period.[103]

Artisanal fishermen also conduct two other traditional fisheries, the beach seine fishery and shellfish fisheries.
Beach seines: The inshore beach seine fishery is conducted in coves and bays. The fishery takes primarily small carangids (*Selar menopthalamus* and *Decapturus sp.*), but smaller catches of blackfin tunas, horse eye jack, and rainbow runners are also taken. Landings in this fishery peak during July and August. The beach seine catch can account for nearly a third of the annual catch.[104]
Shellfish: Divers target lobster, conch, and turtles.[105]

***Photo 28.**--Gear deployed by Grenadian longliners include monofilament line, floats, including one with a radar reflector so that the mainline can be easily located. D. Weidner*

B. Longline fleet

Longlining is a relatively new fishery in Grenada, but has become the industry's most productive sector. Initiated as an artisanal fishery, an active small-scale commercial fishery has developed since the early 1990s. The Grenadian fishermen concentrate on tuna, much of which is exported, but also land sizeable quantities of billfish--mostly sailfish.

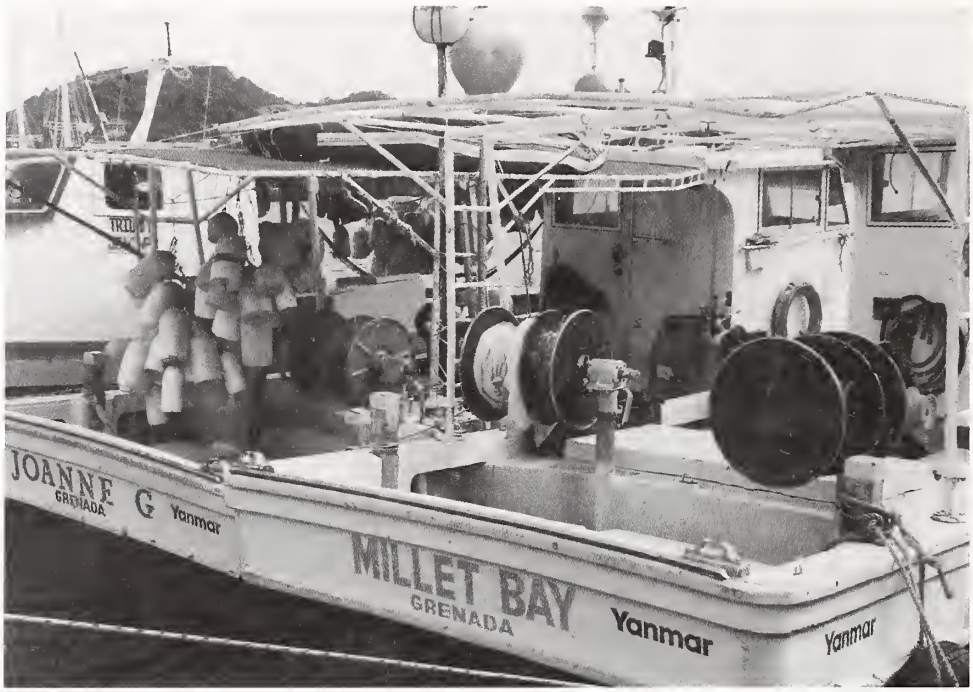


Photo 29.--Standard gear used in the Grenadian longline fishery can be seen on these two longliners moored at the Carenage in St. George's. D. Weidner

Most fishermen have not normally targeted swordfish, but some bycatch is reported. Some fishermen entered the fishery thinking about swordfish, but most were more interested in tuna.[106] Dedicated swordfish operations requires more costly gear and night time sets which has not generally interested the fishermen because many want to return home for the night.[107] Some fishermen complain that the larger, stronger swordfish sometime play havoc with gear set for tuna.[108] Difficulties exporting swordfish have also limited interest in the species.[109] As the industry has expanded, however, larger vessels have been acquired and more fishermen are now conducting multiple day trips. Interest in swordfish appears to be increasing. Grenada since 1997 has reported catches of more than 10 t of swordfish. The 1998 catch was 33 t and the 1999 catch was 42 t (appendix C3), although exports until 1999 had been minimal (appendix D1). Japanese fishing technicians working with the fishermen are helping them develop strategies to increase swordfish catches.[110] While not all companies are reporting increased swordfish catches, there were substantially increased swordfish exports in 2000.

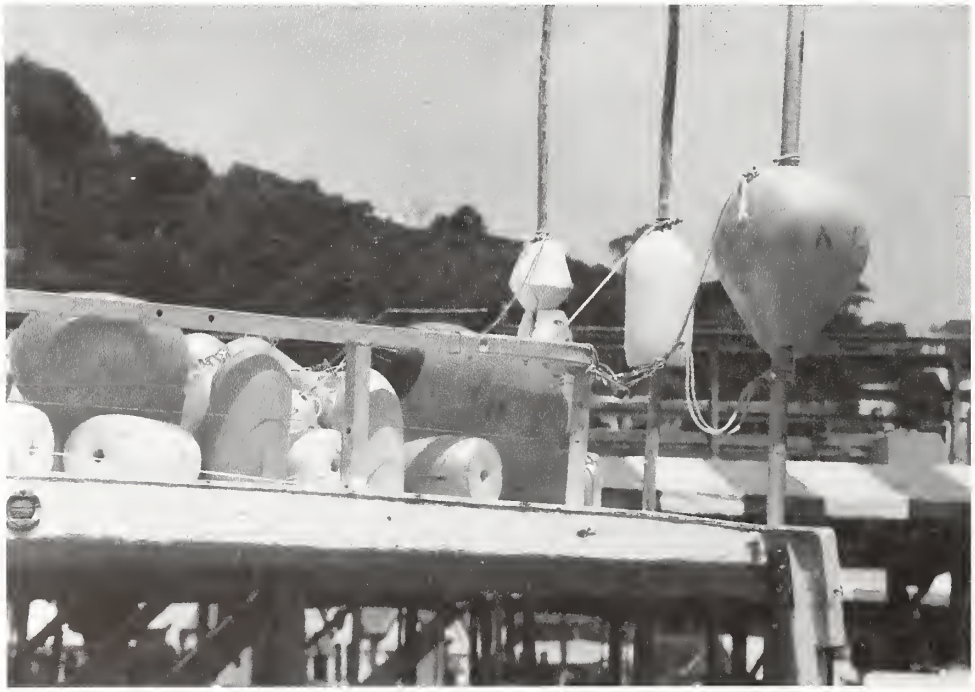


Photo 30.--This Grenadian longline has an upper deck to store floats, buoys, and other equipment. Many smaller longliners do not have adequate storage areas. D. Weidner

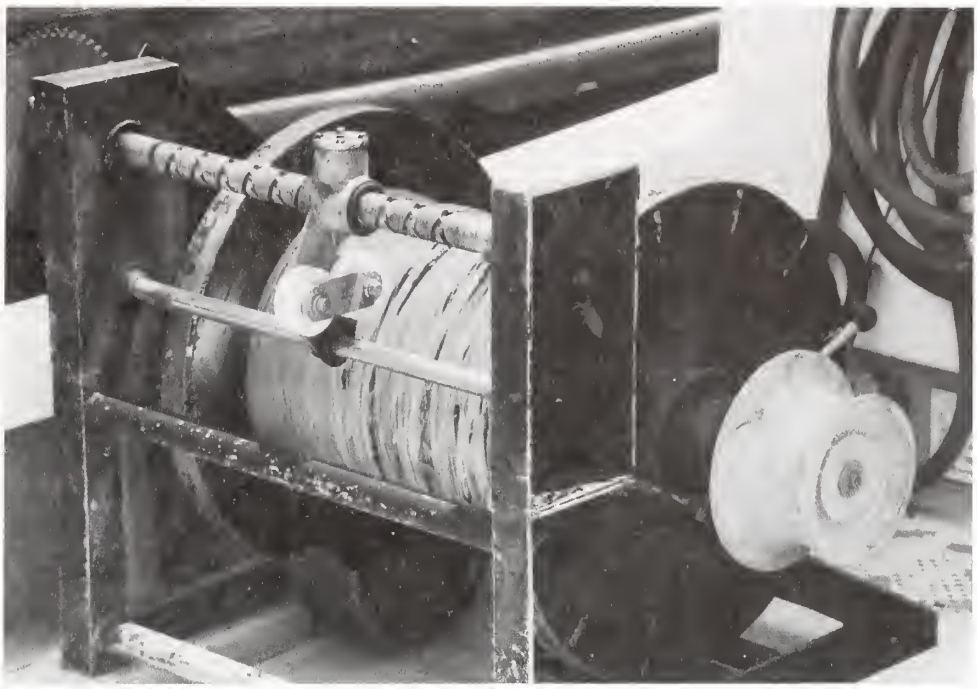


Photo 31.--Some of the larger Grenadian longliners now have hydraulic reels, generally small sizes, but greatly aiding the retrieval of the catch. Dennis Weidner

1. Pelagic

Longlining was introduced to Grenadian fishermen by Cubans in the late 1970s and early 1980s. The Grenadian Government opened a fisheries training school in 1979 and Cuba provided technical instructors. The Cuban fisheries assistance program was part of a larger effort to assist the left-wing Bishop Government which seized power in 1979. (See "XVI. International") One of the fishing methods the Cubans provided training on was longlining.[111] The initial operations were conducted by NFC with ferro-cement boats provided by the Cubans. Longlines were deployed by boxes. There were no reels or mechanized equipment. Grenada's largely artisanal fishermen found this technology suitable for their needs because the gear was inexpensive and simple and could be readily deployed from their small craft--in many cases simple open pirogues.

Grenadian fishermen have significantly expanded their longline operations during the 1990s.[112] Fishermen in the early 1990s began to acquire small, specialized longliners with reels and mechanized equipment. The Japanese donated some small GRP longliners and fishermen have since imported several additional longliners--mostly from the United States. The fishermen now mostly employ American-style operations with monofilament line and reels rather than multi-filament gear and Japanese-style boxes.[113] They have gradually increased the length of their lines and the number of hooks deployed.[114] Monofilament line and hand cranked reels have appeared even on pirogues. Japanese advisers working with the fishermen have been encouraging them to fish further offshore and in deeper waters.[115]

Grenadian longline fishermen currently conduct both artisanal operations with pirogues and small-scale commercial operations with longliners. Operations vary considerably depending on the type of boat deployed.

a. Pirogues

Grenadian artisanal fishermen in 1999 were primarily using pirogues. Estimates vary on the actual number. DF sources estimate that fishermen in 1999 were operating about 200 small, partially decked pirogues, but some sources suggest larger numbers.[116] Industry sources report that a much smaller number of pirogues are now active in the longline fishery. One estimate suggests about 40 pirogues are employed in longlining.[117] Some pirogue fishermen still used the basic longline fishing methods introduced by the Cubans in the early 1980s. Currently they deploy lines of about 3-5 km with 100-150 hooks. Some have installed small monofilament reels. There are no mechanized reels or ice holds.[118] The artisanal longline fishermen conduct day trips, setting their lines in the afternoon and retrieving them about 9:00-10:00 pm. They then return to port after one set with fresh fish.[119] The boats can travel about 30 km in an hour. Few pirogues fish more than about 50 km offshore.[120] They report generally high operating costs as the vessels consume substantial amounts of fuel because of the inherent inefficiency of small outboard motors and running back and forth from fishing grounds after only one set.[121] The artisanal fishermen rarely report taking swordfish, probably because of operations closer to the coast.[122] The timing of sets could be another factor, but some

sources report that both the artisanal and commercial fishermen mostly set in the afternoon.[123]

b. Longliners

Grenadian fishermen conduct what CARICOM officials refer to as small-scale industrial longline fisheries.[124] One source suggests that the fishermen initiated commercial longlining operations in 1991.[125] There may have been some limited commercial operations as early as the late 1980s. U.S. import data suggests that shipments of fresh tuna began to increase in 1991 (appendix D3). Expanding shipments of export grade tuna which has to meet high import standards is generally a good indicator that a fishery is shifting from an artisanal to a commercial operation.

The authors have received varying reports on the number of vessels active in the commercial fishery. This in part because some observers report numbers of longliners without describing just what kind of vessel they are classifying as a longliner, sometimes mixing together small undecked pirogues and more substantial decked longliners. Precise fleet details were not available from the FD.[126] There appear to be 5-8 medium-sized longliners in Grenada, but a total fleet of 30-40 decked longliners 8-15 m long (appendix A2). A wide range of vessel types are being used as longliners. (See: "Fleet.") The FD with FAO assistance in the early 1990s deployed a catamaran prototype which reported good results, but because of the cost has not being adopted by the local fishermen.[127]

The small Grenadian vessels are generally manned with crews of three. Larger longliners may have a slightly larger crew. Grenadian longline fishermen are reportedly the most active in the eastern Caribbean, achieving some of the highest catch rates.[128] This is difficult to assess, but large numbers of Grenadian fishermen do have training and experience with longlining. This is in part the result of the Cuban and Japanese training programs as well as extensive artisanal and commercial operations since the 1980s. Operations of U.S. longliners from Grenada in the 1980s played an important role in introducing U.S. style monofilament gear and techniques to the fishermen. The small crew size and cramped conditions aboard many vessels has made it difficult for ICCAT researchers to conduct at sea sampling and tagging. Grenadian longline fishermen report quite good earnings in local terms. The goal of most fishermen is to own a boat. Generally the captain (boat owner) and crew split the proceeds equally after expenses are deducted. This is a common practice in the Lesser Antilles, although there are differences from island to island.[129]

Photo 32.--The galley of this longliner is located on the aftdeck, immediately behind the wheelhouse--showing the extremely cramped conditions. Dennis Weidner

The grounds targeted are largely dictated by the size and stability of the boats.

Day boats: Small boats make day trips. Grenadian longline fishermen operating 5-6 m boats mostly conduct day trips along the western coast. Most of the fishing is conducted within 30-130 kilometers. Deepwater is fairly close to the western coast and sailfish can be taken within 5 kilometers.[130]

Short-stay boats: Larger boats can fish further offshore than the artisanal pirogues and smaller longliners. Grenadian short-stay have longliners generally made trips of about 3 days/4 nights and complete 4 sets before returning to port. The trips may be gradually increasing in duration. One source suggested in 1990 that the range had more commonly become 3-5 days.[131] A few larger boats may stay out up to 7 days.[132]

Grenadian longline fishermen have primarily targeted grounds in the Caribbean to the west of the island.

Location: Fishermen often operate due west from Grenada, often 60-80 km to the west of the island. Some good fishing is reported off the eastern coast, but sea conditions are rougher there making operations difficult for the small boats that are still an important part of the Grenadian fleet.[133] Other fishermen operate to the south and northwest.[134]

Distance: Despite their greater potential range, even the larger Grenadian longliners usually fish relatively close to the coast. Operations sometimes reflect crew preferences rather than the capabilities of the vessel. Some fishermen may make sets as close as 10-50 kilometers. Others may fish 150 km or more off shore. It is rare for a Grenadian longliner to go more than about 500 km from the island.[135] A typical longliner might fish 100 km from St. George's.[136] Some fishermen operate at greater distances, but 100 km is fairly standard.

Many boats have GPS navigational equipment. Several longliners have radar which not only is an important safety feature, but can be useful in finding the mainline if it becomes separated from the vessel. Losing contact with the mainlinre can occur at night or in rough sea conditions. The Grenadian fishermen do not, however, have sophisticated electronics like sonars for finding fish.[137] Nor do Grenadian longliners have or use satellite imaging services to find fish. While Grenadian fishermen areacquiring somewhat larger longliners, the instrumentation on most vessels is still largely artisanal in nature.

Photo 33.--This buoy highliner has a flashing light and a radar reflector to help the fishermen locate the mainline. Dennis Weidner

Photo 34.--Most Grenadian longliners have converted to monofilament, but some reels are still hand cranked. This is one reason why many fishermen deploy relatively short mainlines. D. Weidner

Photo 35.--Artisanal fishermen use pirogues and a wide range of partailly decked boats to deploy short longlines. Many of these boats are powered by twin outboards. Dennis Weidner

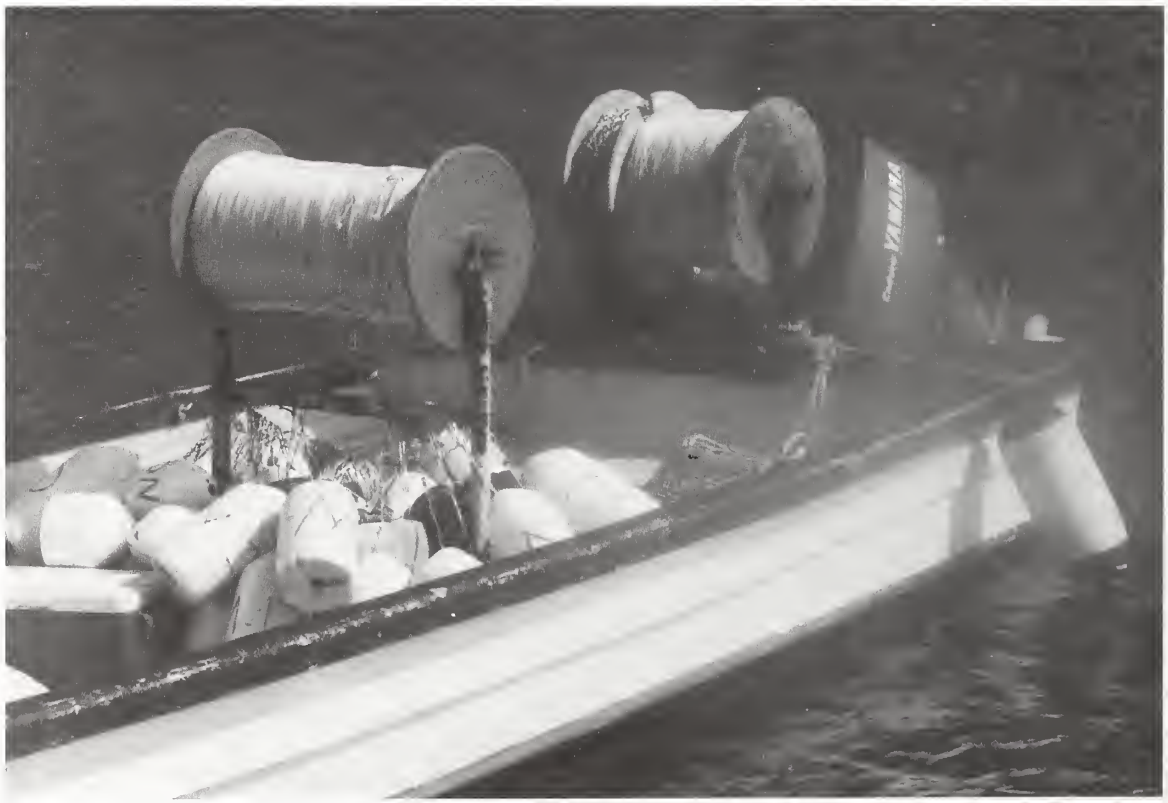


Photo 36.--There are about as many varied desk arrangements ion lngliners as tere are longliners in the Grenadian fleet. Dennis Weidner

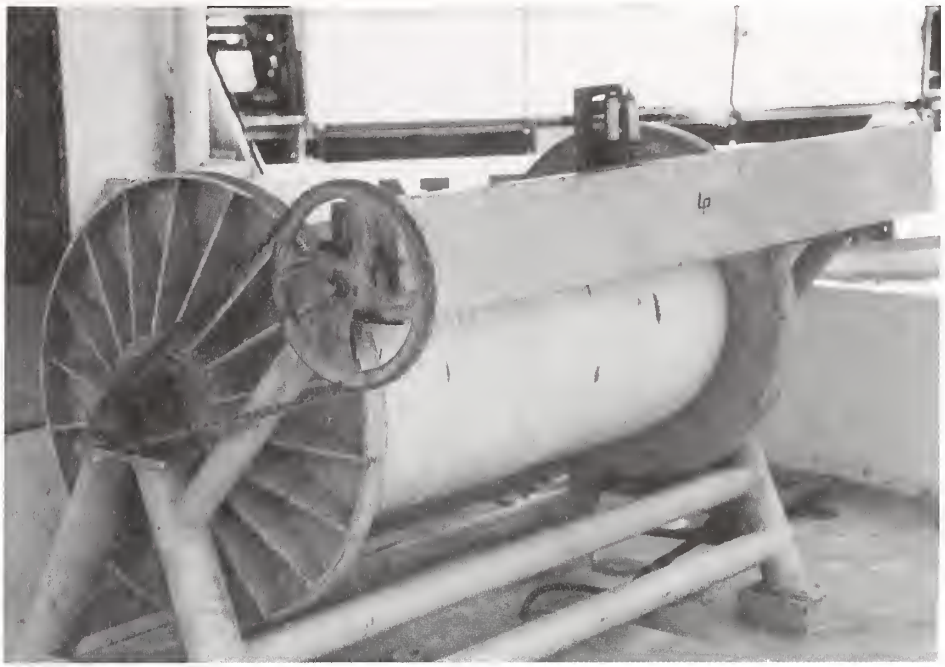


Photo 37.--Only a few Grenadian longlines have large hydraulic reels. Note that this one only has a line loaded for about half of the reel's full capacity. D. Weidner

Some basic information is available on Grenadian longline fleet operations.

Trips: Boats with ice holds normally stay out 3-4 days.[138] Larger ice boats might stay out as long as 7 days.[139] Most longliners make trips of 3-4 days in which they usually make 3 or sometimes 4 sets.[140] The longliners are mostly equipped with ice holds. The short trips made by the small day longliners mean that the catch is usually not kept in the hold for longer than 12 hours.[141] Even the catch of the short-stay longliners is very fresh when delivered, rarely more than 3 days old, except for the few larger boats that may make trips up to 7 days in duration.

Photo 38.--Grenadian longliners have a wide variety of on-deck gear arrangements. Dennis Weidner

Gear: The gear used by Grenadian longline fishermen has changed from Cuban to American style monofilament. The current trend is toward longer lines and more hooks. This is in part an economic trend which along with longer trips results in greater fishing effort per trip and savings in fuel as well as other economies.

Line length: The authors have received varying reports as to the length of the lines that longline fishermen are setting. A 1991 report indicated that the Japanese donated longliners and the larger local vessels were setting mainlines about 15-30 km long. Most of the Grenadian longliners, however, were setting shorter lines, about 10 km long.[142] Another 1991 report suggest that lines about 15 km in length were common.[143] Some reports in the mid-1990s indicated lines as short as 6 kilometers.[144] The authors believe that such short lines are now becoming less common. More recent reports suggest 8-12 km lines were common.[145]

Hooks: A 1990 report indicated that fishermen using relatively small boats deployed longlines with 70-80 hooks and also did some trolling.[146] Fishermen in 1996 were reportedly deploying mainlines as long as 6.4 km with up to 200 hooks.[147] One observer in 1999 reported that lines of about 8 km with 150 hooks were more common.[148] Government officials report that

Photo 39.--This fiberglass longliner has two mounted and one unmounted reels. All are hand cranked. Note the open wheelhouse and lack of electronic array. Dennis Weidner

lines with up to 300 hooks were commonly used during 1999.[149] Industry observers report that some of the larger longliners deploy line of about 12 km with up to 500 hooks.[150]

Depths: The authors have noted varying reports on the depths at which the fishermen set their lines. Fishermen in the late 1980s were reportedly setting hooks at about 45-75 meters.[151] One government official in 1999 reported that depths of 10-60 m were common.[152] Another observer reports that hoowere are generally set at depths of 75-105 meters.[153] Another reported fishing at about 60-150 meters.[154] Some Fishermen report the best tuna catches with the deeper sets. Billfish bycatches, especially sailfish, are higher with the more shallow sets.[155] Swordfish are generally found below 130 m unless fishing at night when they can be taken at about 70 meters.[156]

Bait: The most common bait used by the longline fishermen is seasonally abundant flying fish. But several other species are often used, including ballyhoo, bigeye scads, and jacks. Squid is not commonly available. Light sticks are not commonly used because they are expensive and swordfish is not usually the target species.[157] Fishermen report that obtaining bait is becoming an increasingly difficult problem. The small boat fishermen often catch their own bait using gillnets and beach seines.[158] The commercial fishermen buy their bait because they do not want to spend valuable fishing time catching bait. A number of artisanal fishermen used to supply bait to the longliners and there was a readily obtainable supply. The fishermen report that finding fishermen to obtain bait has become a major problem.[159]

Sets: The small-scale commercial fishermen mostly set their lines in the afternoon. This fishing pattern is similar to that of the artisanal fishermen.[160] In this regard the fishermen have been strongly influenced by Cuban longline methods. This could appears to be changing as the fishermen now use monofilament line. Grenada in the past few years has been reporting increasing swordfish catches--suggesting more evening sets.

Retrieval: Only a few fishermen have hydraulic reels. Most employ hand cranks.[161] The lines take about 5-6 hours to take in. This is an arduous undertaking for the boats without hydraulic reels. Most of the smaller Grenadian longliners employ hand cranks, but all of the larger longliners now have hydraulic reels and an increasing number of the fishermen are acquiring them.

Handling: The tuna and billfish (mostly sailfish) catch as well as any swordfish is gutted and headed aboard the longliners. The authors have received varying reports concerning how the sharks are handled. The shark catch is handled differently depending on the species. Makos are generally retained, but other species may be cut off the line. One official reported that most sharks are finned to retain the valuable fins and the carcasses discarded.[162] Other sources report that finning is not common and the few sharks caught are landed.[163]

Fishermen report generally small swordfish catches. Grenadian fisheries catch data has shown, with only a few exceptions, nil or only minor swordfish catches until 1997. Officials and fishermen have expressed an interest in highseas longlining for swordfish.[164] Grenadian officials report that swordfish longline catches usually peak in the fall and winter.[165] The limited data available to the authors tend to confirm this.[166] The FD also believes that longline fishermen could achieve good tuna catches through the summer and fall, a time when local artisanal fishermen often suspend or limit tuna operations.

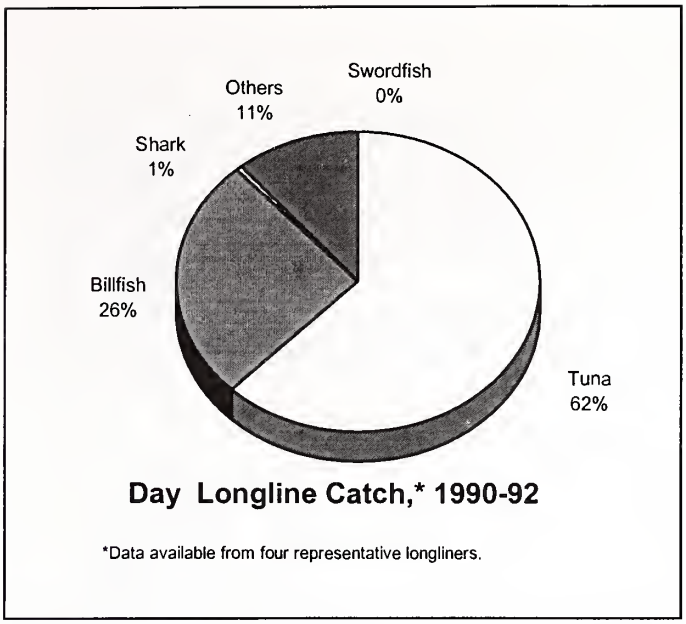


Figure 9.--The pirogue or day longline fleet catch mostly tuna and billfish, but rarely take swordfish.

Grenadian longline fishermen appear to report varying seasonal results and catch composition depending on the type of operations. The authors do not have access to data from actual fishing operations. Studies done aboard representative Grenadian boats during the early 1990s, however, provide some possible insights into species composition and the seasonality of operations:

Dayboats: The day boats reported that tuna comprised most of the catch, over 60 percent. The other major component of the catch was billfish which comprised over 25 percent. Swordfish catches were very limited (appendix B2). The best results were reported from March-May. Fishermen suspended operations during August and September and tuna catches were low during the remainder of the year (appendix B2).

Short-stay longliners: Tuna also dominated the catch of the short-stay longliners, also comprising about 60 percent of the total. The rest of the catch, however, was more varied: billfish (19 percent), shark (7 percent), and swordfish (13 percent). The short-stay longliners were reported operations all year round, but the best catches were noted from March through May (appendix B3). The seasonal results varied by species. Tuna yields varied throughout the year, but were the lowest in June and July and declined again in November and December. Billfish results were also quite varied, but the worst month was August. Shark yields were extremely varied with good months being interspaced with poor months. Swordfish yields were low from April to July (appendix B3).

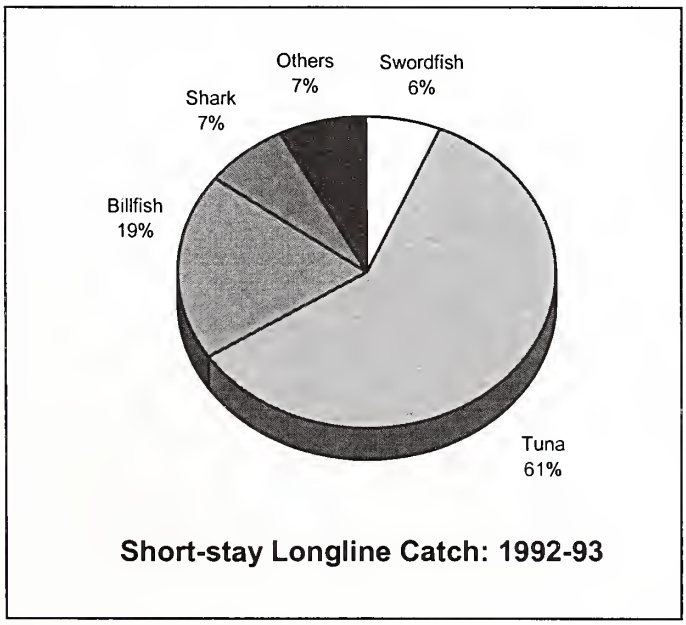


Figure 10.--The short-stay longliners also catch mostly tuna and billfish, but do report a small swordfish catch.

The FD in recent years have been reporting increasing swordfish catches (appendix C4). This probably reflects the increasing importance of the short-term stay vessels as well as the addition of larger longliners which stay on the fishing grounds even longer. Based on the data compiled in the early 1990s (appendix B3), swordfish catches do help the fishermen improve their catches during some months when tuna yields are low. There are some months, however, when both tuna and swordfish yields are seasonally low--especially June and July. The government owned company reports that swordfish catches are best from October to May.[167] This would help support catches during the end of the year when tuna catches tend to be low (appendix B3).

Japanese fishing technicians in 2000 worked with the fishermen to develop improved fishing strategies and higher catches appear to have resulted.[168] Some fishermen in 2000 began significantly shifting fishing strategy. A Japanese fishing technician worked with the fishermen in 2000, suggesting fishing at greater depths. Several fishermen, as a result, have been going further out and making deeper sets.[169] The result has been a substantial increase in the swordfish catch and exports to the United States (appendices D2a1-2). There has also been an increase in tuna shipments to the United States, but only a minor increase compared to that of swordfish (appendix D3).

Photo 40.--A few Grenadian longliners have radio beacon buoys to ensure that the mainline can be found if it becomes separated from the vessel. Dennis Weidner

2. Demersal

The Grenadian longline fishery is primarily pelagic, but artisanal fishermen also set demersal longlines, taking a variety of bottom fish including snappers and groupers.[170]

C. Recreational fleet

Grenada is not well known for recreational fishing. In part because it has not been a major tourist destination. Recreational fishermen report, however, that Grenada offers excellent sport fishing. One sport fishermen in particular was so impressed with the fishing conditions that he has established a charter operation. Fishermen can take fish just 5 km off the western coast which means in the usually calm waters of the Caribbean.[171]

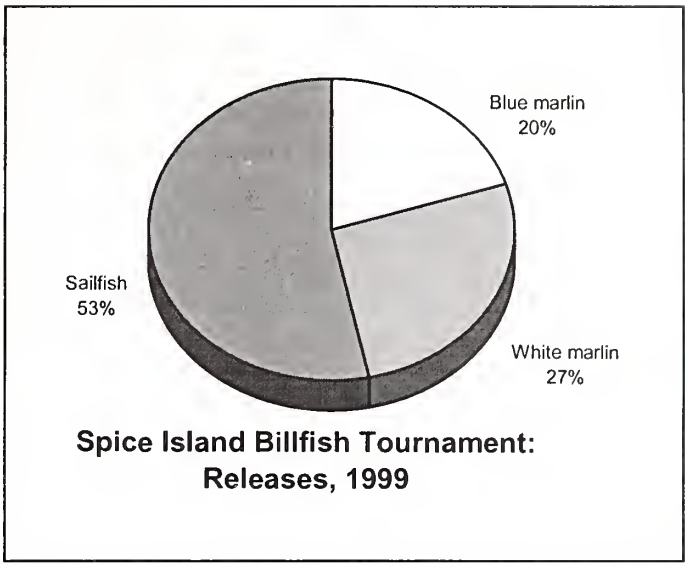


Figure 11.--Most of the releases in the 1999 Spice Island Billfish Tournament, the first catch and release tournament, were sailfish.

Recreational fishermen target blue and white marlin, sailfish, spearfish, tunas (yellowfin, bigeye, and blackfin), dorado, wahoo, king mackerel, and barracuda in addition to a variety of inshore species. Sport fishermen report especially good sailfish catches. Other species commonly taken include blue marlin, yellowfin tuna, wahoo, dorado, and occasional sharks. There is no swordfish sport fishing, but one of the operators is experimenting with it.[172] The largest blue marlin reported in the Spice Island Billfish Tournament is 253 kg (appendix C8). Sport fishermen report, however, that commercial fishermen have taken blue marlin over 450 kilograms.[173] Recreational fishermen often report good catches of blackfin tuna, barracuda, and other species in season only a couple kilometers from shore in water 20-300 m in depth.[174] A few recreational fishermen on Grenada have expressed an interest in swordfish, but most operations troll during daylight hours and do not take swordfish.[175]

The Grenadian recreational fishery is highly seasonal. The best yellowfin tuna fishing, for example, begins in August. Some of the active charter companies are Bezo Charters, Xiphias Seeker, and Reel Affair. The vessels generally use PENN International and SHIMANO reels on custom rods. Charters are available on a full or half-day basis, although billfish fishing requires a full day.[176]

Grenadian sport fishermen formed a volunteer committee in 1964 to organize the Spice Island Billfish Tournament. With a few exceptions, the committee has held the tournament annually and is one of the longest standing tournaments in the southeastern Caribbean. It continues to be the principal sport fishing tournament held in Grenada. The tournament is generally held in January and normally has participants from the United States and neighboring islands. There are normally 40-45 participating boats and they usually report taking 150 or more billfish each year.[177]

1991: The 1991 Spice Island Billfish Tournament was held January 11-13. More than 150 anglers with 31 boats participated. ICCAT researchers report sampling 55 billfish: sailfish (49), white marlin (5), and blue marlin (1).[178]

1999: The 1999 Spice Island Billfish Tournament which was held January 27-30 and had 41 participants boats from Barbados (9), Grenada (10) Guadeloupe (2), Martinique (6), St. Lucia (1), St. Vincent (1), Trinidad (9), the United States (1), and Venezuela (2). A total of 186 anglers registered. For the first time, the Tournament Committee awarded points for the verified tag and release of billfish. The tournament by design primarily targets sailfish, but marlins and other fish are also taken.[179] The Tournament Committee reported in 1999 that 7 blue marlins were retained and 6 released. The largest number of billfish were sailfish, 3 were retained and 16 released (appendix C8). The tournament was sponsored by Carib Breweries, Texaco, and several small businessmen. While the 1999 tournament was the 30th, computerized records exist only since 1994. The tournament committee planed to reconstitute itself as the Spice Island Billfish Association in 2000.[180]

A variety of small boats participate in the local sport fishery. The smallest are open boats 5-6 m boats which are called "pirogues" locally. Charter operators

have boats up to about 10-13 meters.[181] Several companies, like Reel Affair, offer sport fishing charters and other services such as spin and flyfishing for snook and tarpon and even fishing in the island's volcanic lakes and rivers.[182]

The Spice Island Billfish Tournament Committee has been promoting catch and release fishing. As in other Caribbean Island countries, catch and release fishing has been a hard sell. In developing countries a fish means money and the local fishermen are generally reluctant to release a big fish. It has perhaps proven somewhat easier in Grenada, because fish prices are lower than on some other eastern Caribbean islands, thus making the financial sacrifice less costly. A blue marlin that might yield $6 per lb on St Lucia only brings $3 per lb on Grenada.[183] Several of the charter operators, like Reel Affair practice tag and release fishing for the billfish.[184]

Sport fishermen have observed a notable decline in sailfish during the 1990s. In the early 1990s the fishermen could just exit the St. George's harbor and regularly get 15-20 strikes a day. Fishing in 1999 is now more limited. They now have to go a little offshore and anywhere from 0-5 sailfish hits are now more common.[185]

The recreational fishery depends largely on foreign participants. Both tourists making day trips as well as anglers coming to Grenada especially for fishing participate. Most anglers coming to Grenada are Americans. One operator has had some success in attracting British anglers, some of whom contract for an entire week of fishing.[186] There is also some local interest. About 10 local boats regularly participate in the Spice Island Billfish Tournament. ICCAT has been sampling the catch in recent years.[187]

Charter operators do not believe that the Tourist Board gives enough attention to sport fishing which they contend could be an important attraction if properly promoted. The Tourist Board has made some effort. While the Board has not seen fishing as a major attraction. When prompted by the sport fishermen, they have provided some support. The Ministry of Agriculture and Fisheries, however, has shown little interest in sport fishing. The Ministry's attitude is a common one in the Caribbean. Sport fishing is not generally seen as an import source of jobs and income, but rather as an expensive dalliance of rich ex-patriots. The Minister of Agriculture, Lands, Food, Forestry, and Fisheries, Michael Baptiste, during the 1999 IWC meeting after hearing of tag and release fishing, derisively described sport fishing as "a few white boys" with money who "want to let fish go rather than feed hungry people". There is little appreciation of the potential economic impact of sport fishing.

Charter boat operators are concerned about the low rates they receive. In the mid-1990s they were receiving about $750 per day. This was less than the rates on other island. One operator who also worked on St. Lucia reports that this was the rate for smaller boats. Rates by 1999 has fallen to only about $600 per day. One reason that charter rates on Grenada are low is that one operator offers extremely low rates of only about $480 for a full day of fishing. Other boat owners say that this is little above operating costs.[188]

Photo 41.--Anglers aboard the "Wayward Wind" have caught this sailfish which they have tagged prior to releasing it. Bezo Sportfishing Charters

VII. Catch

Grenadian fishermen report substantial tuna (mostly yellowfin) and billfish (especially sailfish) catches, but very little swordfish. The common longline practice of setting in the afternoon and retrieving the line about 9:00-10:00 pm appears to limit the swordfish catch. Available data on the large pelagic fishery, however, differs significantly (appendices C2 and C3-5). The authors are unable to explain these discrepancies. The authors have decided to use the CARICOM/CFRAMP data available since 1988 (appendix C2). The CFRAMP project focused on the pelagic fisheries and theoretically has produced the most reliable data set.

1970-74: Grenadian authorities in the early 1970s reported catch estimates of 1,300-1,700 t (appendix C1). Grenada in 1974 became an independent country.

1975-76: The Grenadian fisheries catch was an estimated 1,700 t in 1975-76 (appendix C1). Tuna catches were estimated at about 200 t (appendix C3). Grenada in the 1975-76 reported a yellowfin catch of 100 t and a bluefin catch of 100 tons (appendix C3). The authors are unsure about the accuracy of the species identification, especially of the bluefin.

1977: Grenadian fishermen in 1977 reported an especially good fisheries catch, nearly 3,000 t (appendix C1). Grenadian fishermen in the late 1970s reported billfish catches of 30-40 t, mostly sailfish (appendix C5).

1978: The fisheries catch dropped sharply to 2,100 t in 1977, but this was still well above 1975-76 catch levels. A very large yellowfin catch of 394 t was reported (appendix C3). The authors are unsure why such a large yellowfin catch was reported, but foreign vessels may have been involved.

1979: The overall fisheries catch declined significantly again in 1979 to only 1,500 t (appendix C1). Fishermen reported catches of yellowfin tuna (520 t) and sailfish (20 t) (appendix C3 and C5). Maurice Bishop seized power in 1979 and attempted to institute a Cuban-style People's Republic. Economic production began to decline. Cuba helped the FD establish a training center in 1979 and provided instructors and ferro-cement fishing vessels, including four which were rigged for longlining. This was the beginning of the Grenadian longline fishery.[189] Another large yellowfin catch of 520 t was reported in 1979.

1980s: Grenadian longline fishermen conducting mostly artisanal or small-scale commercial operations reportedly virtually no swordfish catch during the 1980s. This was because the fishermen set their hooks at about 45-75 m and only operated during the day. Sets of about 130 m were needed to get swordfish during the day. The swordfish rise in the water column to feed at night to about 75 m, but the local boats did not fish at night.[190] Swordfish catches were reported in the late 1980s, but these were largely taken by larger joint venture longliners.

1980: Fishermen reported only a small catch decline in 1980 to 1,400 t (appendix C1). A record yellowfin catch of 709 t was reported (appendix C3). This catch appears too large for the small domestic fleet. Foreign vessels may have been involved.

1981-82: The fisheries catch fell to especially low levels, below 1,000 t in 1981-82 (appendix C1). This may have been due to the disorders and instability associated with the Bishop Government, although the catch decline began in 1978, a year before Bishop seized power.

1983: The fisheries catch increased sharply in 1993 to 1,500 t (appendix C1). Fishermen reported a record yellowfin catch of over 280 t in 1983. Billfish catches were stable at about 30-40 tons (appendix C5). The Cuban fisheries assistance program ended in 1983 with the U.S. intervention and the fall of the PRG, but by that time quite a few fishermen had been trained in basic longline techniques. Grenadian officials believe

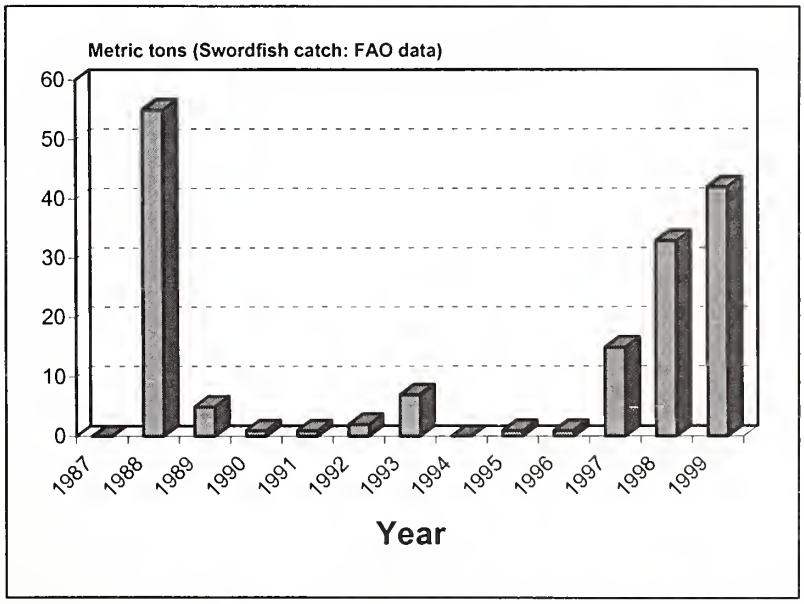


Figure 12.--Grenadian swordfish catches have been limited. The large 1988 catch was taken by joint ventures. Grenada since 1997, however, has reported a substantial increase in swordfish catches.

that the instruction with basic, non-mechanized gear was particularly useful for the fishermen.[191] Grenadian fishery statistics are somewhat confusing, but catch data does suggest a notable improvement in species taken by longliners. Higher tuna catches, one of the primary target species of the longline fishery, were reported in 1983 (appendix C3).[192]

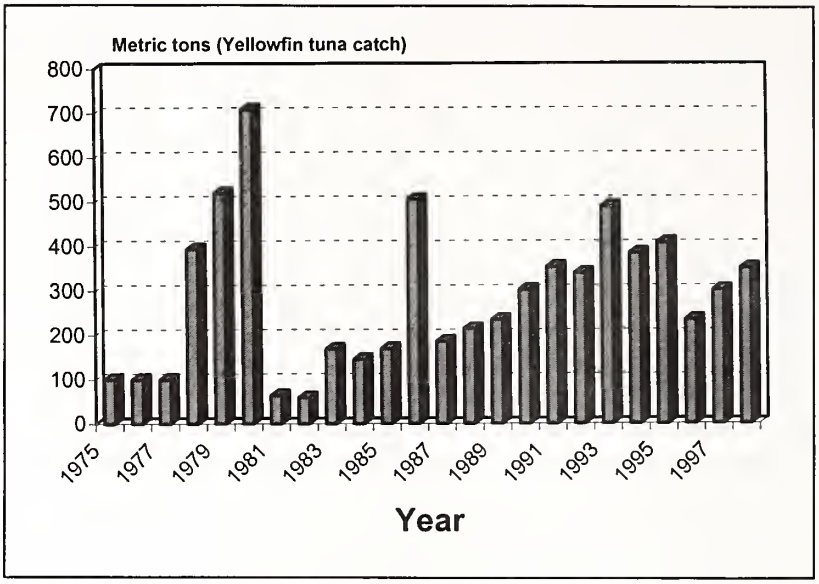


Figure 13.--The best indicator of trends in Grenada's longline fishery is probably the yellowfin tuna catch as it is the primary target species.

1984: The Grenadian fisheries catch increased again to 1,600 t in 1984. Sailfish catches increased sharply, exceeding 65 t (appendix C5). The fishing industry appears to have begun to expand in the more favorable economic climate after the 1983 fall of the PRG. An assessment of the Grenadian billfish fishery notes the expansion of billfish catches beginning in 1984, but does not reveal why catches increased so sharply.[193] The longline training provided by the Cubans was probably an important factor explaining the increases in sailfish and tuna catches during 1983-84 (appendices C4-5).

1985: The overall fisheries catch continued expanding to 1,700 t in 1985. Billfish catches increased sharply in 1985 to nearly 165 t of sailfish alone (appendix C5).

1986: Fishermen reported excellent catches in 1986 of 2,700 t, nearly reaching the 1977 record (appendix C1). Pelagic fishermen set and all time record, catching more than 500 t of yellowfin and about 200 t of sailfish (appendices C3 and C5). They also reported incidental catches of marlin and swordfish.[194] The marlin catches reached a record 36 t (appendix C5). Foreign fishermen may have been involved in the higher tuna catches reported beginning in 1986. U.S. longliners have not reported landing catches in Grenada (Caribbean Overview, appendix E1). Some U.S. longliners did operate from Grenada during 1986-88.[195]

1987: The yellowfin catch declined sharply to only 186 t in 1987 (appendix C3). Sailfish catches also fell to only 104 t (appendix 5). A few U.S. longliners were active out of Grenada during 1987 One U.S. longliner was seized prompting U.S. fishermen to obtain Grenadian licenses. The seizure was the first step in the often complicated legal proceedings U.S. longline fishermen encountered.

1988: CFRAMP data available beginning in 1988 (appendix C2) suggests much larger pelagic catches than those reported by FAO (appendix C4). The yellowfin catch in 1988 exceeded 375 t (appendix C3). CFRAMP reports a swordfish catch of nearly 100 t in 1988 (appendix C2), although FAO reports only 55 t (appendix C4) . These substantially higher catches were almost certainly the catch of 6-8 U.S. commercial longliners operating as part of joint ventures during 1988-89 (appendix E).[196] The authors are unsure as to precisely how the catch from the U.S. longliners was handled statistically. The tuna and billfish catches increased only slightly (appendices C3 and C5). It may be that because the U.S. joint-venture vessel targeted swordfish that there were only minor catches of tuna and billfish. The swordfish and tuna catch of the joint-venture vessels was exported to the United States and the billfish catch marketed in Grenada.

1989: The yellowfin catch continued expanding, exceeding 410 t in 1989 (appendix C2). Sailfish catches declined to only about 170 tons. Swordfish catches plummeted to less than 9 tons. This sharp decline is also confirmed by available FAO data, although the precise quantities differ. U.S. longliners reported only small longline catches in 1989 (appendix C4) and left Grenada by the end of the season. The Fishermen operating medium sized vessels normally achieve a catch of 1.8 t of swordfish and 1.4 t of tuna on a 3-10 day trip. U.S. fishermen in Grenada were unable to achieve the 0.4 t-0.5 t of swordfish per set that they felt was necessary for a profitable operation.[197] Catches of the coastal pelagics were disappointing. The disappointing 1989 pelagic catch prompted FAO to sponsor an assessment of available catch data from St. Vincent and neighboring islands.[198]

1990: The 1990 swordfish catch was a mere 1 t (appendix C4). Yellowfin catches increased to over 300 t (appendix C3). One report indicated that tuna catches were particularly good and that fewer billfish were landed.[199] Available catch data, however,

suggests billfish catches also increased (appendix C5).

1991-92: Grenadian fishermen in 1991-92 continued to report only minimal swordfish catches of 2-3 t (appendix C3). The yellowfin catch increased steadily during the early 1990s, presumably aided by the acquisition of commercial longliners from the Japanese. The yellowfin catch exceeded 600 t in 1991, but declined slightly in 1992 (appendix C2). Sailfish catches recovered somewhat to over 300 t in 1991 and 1992. The marlin catch set a new record of nearly 64 t in 1991 (appendix C2). Swordfish catches during this period were negligible, amounting to only 3 t in 1992. The acquisition of the new Japanese longliners in the early 1990s led to expanded fishing effort. The best available indicator of longline activity, in the absence of actual Grenadian fishing effort data, is U.S. tuna imports. Tuna is the principal target species of the longline fishermen and the United States is the principal market. Tuna shipments were a modest $57,000 in 1990, but had increased to over $150,000 by 1992 (appendix D3). The Government in 1990-92 collected some effort data on the smaller longliners. Most of the catch was tuna and billfish with only minimal swordfish catches (appendix B2).

1993: Fishermen continued to increase tuna catches in 1993, taking 860 t of yellowfin--an all time record (appendix C2). Fishermen reported increasing CPUEs, possibly because of the expanding capacity of the longline fleet.[200] Sailfish catches, however, declined to less than 250 tons. The swordfish catch 7-13 tons, depending on the source (appendix C3). There was significantly expanded longline fishing in 1993 as shipments of tuna exceeded $0.5 million.

1994: Swordfish catches declined to minimal levels in 1994 , although U.S. import data suggests that some swordfish was being landed (appendix C4). One source suggests that the tuna catch dropped sharply in 1994. Yellowfin catches totaled only 385 t, less than half the 1993 catch (appendix C2). Other sources suggest a more modest decline (appendix C4). Sailfish catches declined to only 150 t, although the marlin catch was relatively stable at about 50 tons. No data is available on the swordfish catch. While catch data shows declines, U.S. import data suggests increasing effort and fishermen shipped over $1.1 million of tuna to the United States in 1994 (appendix D3).

1995: Swordfish catches in 1995 were negligible (appendix C4) which was confirmed by the absence of U.S. imports from Grenada (appendices D2a1-2). Extensive longline activity, however, is shown by strong tuna catches (appendix C3) and record imports of fresh yellowfin. As yellowfin is the primary target of the longline fishermen, it is a better indicator of actual longline activity.

1996: The Grenadian swordfish catch was little changed in 1996. The FD reported a 1 t catch to FAO, although ICCAT reported a 4 t catch (appendix C4). Yellowfin catches, however, declined sharply as did billfish catches (appendices C3 and 5).

1997: CFRAMP reported that catches of yellowfin and blackfin tuna as well as bonito declined sharply in 1997. A much smaller decline was noted in the catch of skipjack, wahoo, and sailfish. Neighboring islands reported varied species fluctuations.[201] Fishermen reported, however, a substantial increase in the swordfish catch which rose to 14.8 t (appendix C2). This data was confirmed by FAO (appendix C4). Surprisingly there was no increase in shipments to the United States (appendix D2a1). This is highly unusual. The general pattern in the Caribbean is for swordfish to be exported to the United States rather than marketed locally. The 14.8 t catch seems rather a large quantity to be marketed locally.

1998: FAO reported a substantial increase in the swordfish catch during 1998 to 33 t (appendix C4). Again this is not confirmed by

Photo 42.--Larger longliners like "Rainbow Chaser" are allowing the Grenadian fishermen to move offshore and fish in deeper water. As a result, the swordfish catch has been increasing. D. Weidner

Photo 43.--The Grenadian swordfish catch is still small but longline fishermen have been reporting stead increases in recent years. Dennis Weidner

increased shipments to the United States (appendix D2a1). Grenadian companies have confirmed that they do market swordfish domestically. GCFL in particular turned to the domestic market after FDA had detained swordfish shipments to the United States in the mid-1990s.[202] Another company, Caribbean Seafood, had an FDA exemption to automatic detention and could have easily exported swordfish (appendix D4a). While the Grenadian tourist industry was growing in the 1990s, 33 t of swordfish seems like a very large quantity to market domestically. One seafood company had no statistical data, but did indicate that there was a substantial and growing domestic market for swordfish on Grenada. A company spokesperson indicated that swordfish not only was in demand from tourist restaurants and hotels, but that it also sold well in the domestic markets.

1999: Grenadian fishermen continued increasing their swordfish catch in 1999. They reported a catch of 42 tons (appendix C4). U.S. import data does not confirm that level of activity. U.S. swordfish imports from Grenada increased to 3.2 t in 1999 (appendix D2a1). This would be nearly 4.5 t live weight, but still far below the level of catches reported in 1999. This suggests that there could have been substantial domestic sales.

2000: Grenadian swordfish catch data is not available for 2000. Local sources report considerable difference of opinion concerning catch trends. Some observers report swordfish catch increases in 2000. An exporter indicates that a Japanese fishing technician working with the fishermen reportedly encouraged them to fish at greater depths resulting in increased swordfish catches.[203] A company representative that markets domestically says that he has noted that both the larger longliners operating offshore as well as the smaller longliners operating along the coast landed more swordfish which has caused the domestic price to decline.[204] Another exporter, however, report that they have not seen larger swordfish catches.[205] U.S. import data shows that swordfish shipments to the United States increased very substantially to 32.7 t in 2000 (appendix D2a1). This along with some possible domestic sales suggest a catch of over 50 t live weight (appendix C4). The U.S. import data seems to indicate that there were substantial catch increases in 2000. Another possibility is transshipments but the regularity of the 2000 shipments means that such shipments would become widely known in industry circles. Tuna catches also increased, but only marginally (appendix D3). A second Grenadian company, Seafood Ltd., in 2000 obtained an FDA exemption from automatic detention for exporting swordfish to the United States (appendix D4b). A third company, Mervyn James, was attempting to obtain a FDA exemption (appendix D4a).

2001: No catch data is available for 2001. Grenadian sources reported no notable catch trends in 2001, although it was still quite early in the year when they were contacted.[206] U.S. import trends show imports running somewhat behind 2000 levels (appendix D2b). The bulk of the imports generally come during the second half of the year, so first half results may not be a good indicator of full year trends.

***Photo 44.**--Artisanal fishermen use unimproved sites all over the island, but are increasingly landing their catch at improved sites which the Government has prepared for them. Dennis Weidner*

***Photo 45.**--Longliners using the Grenada Yacht Services pier can land their catch right at the Caribbean Fisheries processing plant. Dennis Weidner*

Photo 46.--These longliners have moored at the cement seawall along the Carenage. Their catch is loaded aboard trucks which take the catch to nearby processing plants. Dennis Weidner

VIII. Ports

More than 90 percent of Grenada's artisanal catch is landed on the main island of Grenada. CARICOM reports that there are 29 landing sites on Grenada and 10 in the Grenadines.[207] The most important landing sites are seven Government operated landing centers. The bulk of the catch is landed along the western coast where the longliners are most active. Much of the spear and line fishing is conducted from the eastern ports.[208] The two most important ports are along the western coast, Gouyave and St. George's. The artisanal longliner fishermen operate from many different sites which in addition to St George's (Melville St) and Gouyave), Victoria, Waltham, and Duquense are of some importance.[209] The small-scale commercial longliners are all based in either St. George's (including Grand Mal) or Gouyave.[210]

A. Eastern coast

Fisheries off the rougher eastern (windward oceanic Atlantic) coast are relatively limited. The principal landing site along eastern (windward) coast is Grenville. Fishing from Grenville is primarily oceanic operations for pelagic species, *Scomberomorus spp.*, *Coryphaena spp.*, scombroids (mackerels and tunas), *Carangids*, and other species.[211] The fisheries are mostly artisanal using handlines.

B. Western coast

Most of Grenada's catch and virtually all the small-scale commercial longline catch is landed along the western coast. Most of the export companies operate from the western ports. The principal landing sites along the western coast are St. George's, Grand Mal, and Gouyave.

St. George's: Most of Grenada's seafood companies and exporters are based in St. George's. Most of the Grenadian longliners also operate from St. George's. There are three sites at St. George's where the longliners land their catch.

The Lagoon: The main port area in St. George's is Gran Grenada Yacht Services which maintains both a marina and a landing site in "The Lagoon". Most of the Grenadian longline catch is landed here at a pier opposite the Grenada Yacht Club. Longline fishermen can land there catch at the Lagoon for handling by Caribbean Fisheries which has its plant there. The pier

Photo 47.--The Japanese financed Melville Street pier was still under construction in 1999, but fishermen have begun to use the completed pier in early 2001. Dennis Weidner

Photo 48.--GCFL operates a pier and processing plant built by the Japanese a few kilometers north of St. George's at Grand Mal. Dennis Weidner

is an unimproved wooden one, but the location next to Caribbean Fisheries is an advantage. Caribbean is the most established Grenadian exporter and has qualified for an exemption to the FDA automatic swordfish detention rule (appendix D4b).

The Carenage: Cruise ships dock at the Carenage which is a protected inlet jutting into St. George's. Mooring facilities are available in both "The Lagoon" and the Carenage at St. George's proper. Longliners moor at the cement seafront which extends for about 100 meters. Longliners working with Seafood Limited land their catch here where it is transported to the plant located about 10 km away at an industrial park. There is also an area for artisanal fishermen to moor their pirogues.

Melville Street: A new pier and fisheries market, with Japanese assistance, was under construction at St. George's in 1999. It is located opposite the old fisheries market on Melville St. The pier is outside the protected Lagoon and Carenage area and runs right along the unprotected western St. George's seafront. The old pier and market has in the past been destroyed by hurricanes. Because of such damage it has not been used by the longliners in recent years, but mostly by artisanal fishermen. The pier was completed in late 2000 and artisanal fishermen have begun using it, even though the associated marketing and other facilities have not yet been completed.

The Spout: Recreational fishermen and boaters in St. George's use the Grenada Yacht Club marina at the Spout, located between the Carenage and the Lagoon. There are also facilities for mooring recreational boats at Grenada Yacht Services. The new Grenada Marine facility at Cornith has excellent facilities for recreational boats. It is only about an hour from St. George's but the connecting road to the main highway in 1999 was unimproved. Some of the recreational fishermen use their pirogues to catch marketable fish as well.

Gouyave: The main port area is the Gouyave Town Mall which is both a fishing port and a landing site. Many small boats operate from the port, but there are also a few longliners.[212] A few exporters operate at Gouyave. One 1991 report indicated that longliners were landing substantial quantities of billfish at Gouyave.[213] As a result, a lot of the ICCAT shore-based sampling effort has been conducted at the Gouyave Fish Center.[214]

Grand Mal: Grand Mal is located a few kilometers north of St. George's. Several longliners land at the

Photo 49.--These longliners have moored at the cement seawall along the Carenage. Their catch is loaded aboard trucks which take the catch to nearby processing plants. Mark Farber

Photo 50.--Both recreational boats and longliners use the facilities available at Grenada Yacht Services in the St. George's Lagoon. Dennis Weidner

new Grand Mal pier where they have access to the modern new GCFL processing facility. The fishermen can land their catch there and have access to water and ice.[215] GCFL reported that it was no longer exporting swordfish, but was exporting the tuna being landed by the longliners.[216]

Grenville: A variety of small dayboats with fishermen using handlines and trolls operate from Grenville on the eastern coast.[217]

Halifax Bay: A project to build a fisheries complex at Halifax Bay, between St. George's and Gouyave, was announced in 1981.[218] Another report indicated that work on the port financed in part by the Caribbean Development Bank (CDB) was in progress during 1983.[219]

Victoria: Some fishermen land their catch at the northwestern town of Victoria. A 1991 report indicates that some billfish was being landed there.[220] Longliners landing export-grade product do not normally land their catch here. Some fishermen also land fish at the nearby village of Waltham.

Others: Smaller sites exist Duquesne Bay, and Sauteurs. These sites are mostly used by artisanal fishermen.

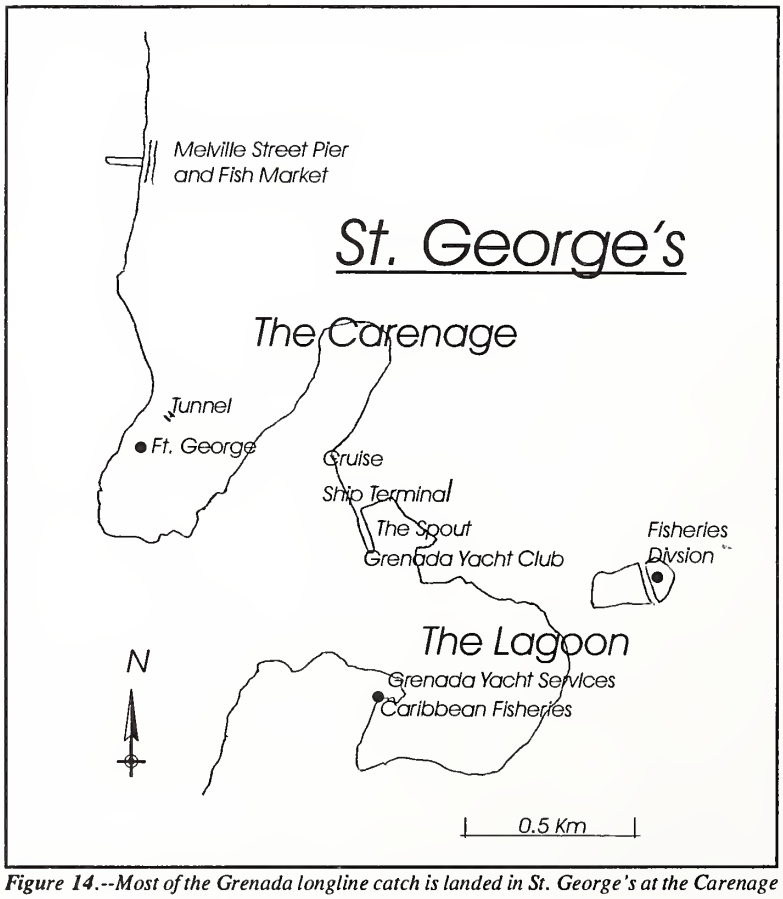


Figure 14.--Most of the Grenada longline catch is landed in St. George's at the Carenage or Caribbean Fisheries. Artisanal fishermen have begin using the new Melville Street pier.

C. Other islands

Small landings are also reported on the southern Grenadine islands to the north of Grenada, Carriacou and Petit Martinique. One of the six principal government marketing centers is located on Carriacou. The major port on Carriacou is Hillsborough on the western side of the island. A substantial number of fishermen operate from Petite Martinique. Much of their catch is marketed in Martinique aboard trading vessels.[221]

IX. Transshipments

The authors know of no significant swordfish transhipping by distant-water fishermen through Grenada, but some activity has been reported by U.S. and Venezuelan fishermen.

United States: Some of the U.S. fishermen operating out of Grenada may have landed some of their catch at St. George's.[222] Most of the landings were bycatch species. The authors note, however, that the United States reported swordfish imports totaling 55 t from Grenada in 1988 (appendix D2a1). It is possible that this could have been swordfish landed by the U.S. longliners that were active out of Grenada in 1988.

Venezuela: Grenadian officials report that some Venezuelan longline fishermen have transshipped their through Grenada. Grenadian officials subsequently concluded that this may have transpired as an effort to avoid ICCAT catch restrictions. As a result, Grenada refused to allow the Venezuelans to continue transhipping.[223]

One Grenadian company in 2000 reports being contacted by a Trinidadian-owned, but Grenadian flagged longliner.[224] The Trinidadian fisherman wanted to land his swordfish catch in Grenada. The Grenadian company declined to handle the swordfish, but would have handled tuna.[225]

Some observers reported increasing government concern with reflaggings in 2000. One report indicates that government inspectors were active in 2000, checking to ensure that landings were actually Grenadian-caught fish.[226]

X. Processing and Products

Much of the Grenadian fisheries catch is sold fresh at landing sites or in markets with little processing. Relatively primitive processing is available in the market stalls. Fish fillets are available there or the desired cut of billfish, especially sailfish, tuna, or sharks. Swordfish is also sometimes available. Several Grenadian companies have developed much more sanitary practices for handling the longline catch destined for export markets. The longline catch is landed within a few hours of being caught, as most Grenadian fishermen conduct day trips. Even the larger longliners land fis that is only a few days old. The fish to be exported is selected out and graded for quality. It is then packed in thermal bags and put in a waxed cardboard box.[227]

There is little value-added processing of seafood in Grenada. Some observers have noted the shortage of available cold storage which has forced fishermen to reduce effort in some years. Most of the catch is sold fresh in local markets.[228] Caribbean Seafood in 1999 built a large new cold store and chill room near its St. George's plant. There is some limited seafood processing on Grenada. A saltfish processing operation was conceived in 1987 as a joint venture with Canadians who were to provide the cod.[229] Some locally caught shark was dried as a domestic substitute for imported dried cod which is used in many traditional dishes. The country's first cannery was opened in 1980 at True Blue.[230]

Photo 51.--Caribbean Fisheries in 1999 was completing a new cold store and chill room near its St. George's processing plant. Dennis Weidner

Photo 52.--Fish processing can be very basic on Grenada, even in established markets. These jacks are being processed at a rudimentary market stall. Mark Farber.

Photo 53.--The market vendors in Grenada are mostly women. This vendors offers sailfish which unlike the tuna catch can not be exported to the United States. Mark Farber

XI. Companies and Cooperatives

A. Companies

A number of fishing companies are active in Grenada. The country is one of the few companies besides Cuba where a state-owned company still plays a major role in the fishing industry. One observer indicated that there were also three private companies active in Grenada. The companies are involved in the marketing sector and for the most part do not operate large numbers of fishing vessels.

Available information on companies operating in Grenada includes:

Amerijet: Most of the export shipments are carried out by the Amerijet Company which operates flights to Miami. Previously the shipments were made on American Airlines.

Caribbean Seafood Ltd.: Caribbean Seafood Ltd. (CSL) has been operating since 1984. It is the most established seafood dealer on Grenada. The company buys the catch directly from the Grenadian longliners and both sells in the local market or exports the product. They handle about 1.5 t of fish weekly.[231] The product flow is seasonal with May and June the heaviest months. The exported fish, mostly yellowfin tuna, is packed in cardboard boxes and shipped aboard Amerijet and American Airlines flights. Swordfish is not a major part of the company's business. Caribbean Seafood was the first Grenadian company to obtain an exemption from the FDA automatic swordfish detention rule (appendix D4b). Even so, swordfish shipments are relatively limited. The company does not always have the proper size cardboard boxes on hand when the fishermen bring in swordfish.[232] Unlike some other Grenadian companies, Caribbean Seafood did not reported any significant increase in the quantities of swordfish being landed or shipped during 2000.[233] Company owner Jason Fletcher is critical of the state-owned GCFL which receives some financial support from the Grenadian Government. CSL and other private companies thus find it very difficult to compete. The CSL pier is located in the Lagoon opposite the Grenada Yacht Club and alongside Grenada Yacht Services. Many of the larger longliners land their catch at the CSL pier. The company works with about 17 longliners and a few pirogues. The company reports that competition with other buyers has pushed prices up in Grenada in recent years to the benefit of the fishermen. This has, however, squeezed CSL's profit margins.[234] The company has built a new cold store at a nearby industrial park.[235]

Finair: This air cargo company began operating flights to Miami in 1999.

Grenada Marine: This new shipyard and boat storage area was opened in 1999 at a new facility built at Corinth along the southeastern coast. The owner, Jason Fletcher, also owns Caribbean Seafood.

Grenada Commercial Fisheries Ltd. (GCFL): Government officials felt that there was a need for a state corporation to provide a market for the catch of the artisanal fishermen, many of which often had difficulty selling at reasonable prices. When the Artisanal Fisheries Development Project (AFDP) was completed, the staff and some of the program was merged into the GCFL. The longliners provided by the Japanese were at first operated by GCFL, but were sold off to local fishermen in 1991-93 as the company decided to focus its operations on marketing.[236]

Photo 54.--This is one of the longliners which works with Caribbean Fisheries. They are moored by the St. George's plant next to Caribbean Yacht Services. Dennis Weidner

Photo 55.--The modern GCFL plant at Grand mal was built as part of the Japanese fisheries assistance program. About 30 longliners, including many small ones, work with the company. Dennis Weidner

Grenada Commercial Fisheries is a now a state marketing corporation. They buy fish from various Grenadian fishermen, including the schooners and longliners, and sell it in both domestic and export markets. About 30 of the 70 decked and undecked longliners in Grenada land their catch at GCFL. The company does some processing, mostly filleting. They experimented with smoking, primarily sailfish, but discontinued such operations in 1996.[237] The company's major facility is a processing plant and pier at Grand Mal. It was financed by a Japanese grant. The processing plant was opened in 1997. GCFL was handling about 2-5 t of swordfish per year in the mid-1990s.[238] The Grand Mal plant produces some steaks and fillets. As with the other Grenadian companies, the tuna and swordfish was mostly exported. The fish is air shipped to the United States. There are sometimes problems finding available air cargo space.[239] After a shipment of swordfish was detained in 1996, the company began marketing swordfish locally. Company representatives report that there is a strong local demand for swordfish. The company has noted expanded swordfish landings in 2000, both the larger vessels operating offshore and small vessels fishing closer to the coast have been bringing in more swordfish.[240] The billfish catch is all marketed locally at hotels and restaurants. The tunas continue to be exported. The small quantity of shark landed is salted. There is a marketing facility at Burns Point and facilities for the fishermen (ice machine, freezer, and social center) at Gouyave and Grenville.[241]

Photo 56.--These two GRP longliners work with GCFL and land their catch at the Grand Mal processing plant financed by the Japanese. Dennis Weidner

Mervyn James: Mervyn James is known to have handled swordfish in 2000. FDA reports that several swordfish shipments to the United States from Mervyn James were detained in 2000 (appendix D4a). The company may be attempting to qualify for an exemption to the automatic detention requirement for

Photo 57.--Seafood Limited does not have its own pier. Longliners working with the company unload at the Carenage where trucks transport the fish to the company's processing plant. D. Weidner

swordfish. The authors were, however, unable to find information on this operation and Mr. James was unknown to other Grenadian seafood companies interviewed for this report.

Independence Agencies: This company is one of the companies handling seafood. No information is available on the facilities or activities.

National Fishing Company/National Commercial Fishing: The Grenadian Government established the National Fishing Company (NFC) in stages to harvest, process, and market seafood. The company began operations in 1980 as part of the PRG's efforts to operate state enterprises. Cuba donated 13 commercial vessels during the early 1980s. The NFC fared no better than most other efforts to operate state fishing companies in Latin America.[242] The NFC attempted to operate the Cuban vessels for a few years, but was unable to achieve profitability. Accounts vary somewhat, but most of the vessels were apparently ferro-cement trawlers. There were also 4 longliners, sometimes referred to as bonito boats.[243] One reported suggested that the vessels were in poor condition when delivered.[244] The problem, however, may be related to the Cuban lack of consideration of operating costs. The Soviets provided Cuba fuel and Cuban state companies had only primitive accounting standards. Cuban fishing operations did not have to generate income to pay for fuel and other costs at market prices.[245] The NFC also purchased the deep-sea fishing vessel *Alister* in the United States.[246] The NFC during the early 1980s was buying fish that could not be sold for smoking, filleting, and salting.[247] The company has reported some difficulties with both its fleet and marketing divisions, but also successes such as introducing new methods to the artisanal fishermen.[248] After the return of constitutional government, a committee was formed to review the operation of 22 state corporations, including the NFC. The resulting Singh report recommended in 1984 that the NFC be closed and the assets leased or sold.[249] The company was phased out with the development of the Artisanal Fisheries Development Project (AFDP).[250]

Nordom: Nordom is located at Gouyave. The company does not have its own pier, but buyers purchase raw material from the fishermen at various landing sites. The company does some exporting.

Seafood Ltd.: Seafood Ltd. focuses primarily on exporting fishery products. It is operated by Alex Swan. The company has no pier of its own, but buys raw material from fishermen at various landing sites. This Barbados company began operating in Grenada during 1994 and in 1999 was working with about 10 longliners, varying from 6-14 m in length. The fishermen land their catch at the Carenage in St. George's and Seafood Ltd. picks it up with a insulated truck. The company does not work with the small-scale pirogue artisanal fishermen. A company spokesman reports that most artisanal fishermen do not use ice or properly handle the catch, they often deliver poor quality product. Seafood Ltd. helps the fishermen with which the work finance fishing operations, including the provision of ice, bait, hooks, and line. Seafood Ltd. then deducts these costs from the proceeds of the fish delivered. They handle a variety of fish taken by the longliners, including tuna, dorado, marlin, sailfish, and swordfish. Shark is not popular on the local market. Some species are used for dog food. The billfish sells well on the local market. Seafood Ltd. does some exporting, in the past mostly tuna and swordfish to the United States. All the good quality tuna delivered by the associated longliners is exported. The company has experienced problems getting air cargo space. Seafood Ltd. but reported in

late 1999 that the situation was improving. The company in 1999 was not shipping swordfish.[251] As fishermen began landing more swordfish in 2000, the company has made several swordfish shipments in 2000, qualifying for exemption to the U.S. FDA automatic detention rule (appendices D4a-b). The reported detentions were necessary to qualify for the exemptions. There have also been some spot checks. Company officials report that the FDA carried out the inspections of detained product very quickly and the quality of the shipments was not degraded during the inspection process.[252] Some billfish is purchased from the Taiwan companies operating on Trinidad for sale in the local market.[253]

Photo 58.--Seafood Limited is owned by Alex Swan. The seafod tey handle is process here in an industrial part near the Salines International Airport. D. Weidner

(Alex) Swan: See "Seafood Ltd."

B. Cooperatives

The PRG attempted to form fishery cooperatives during the early 1980s, but with little success. The National Agricultural Cooperative Development Agency (NACDA) was interested in helping artisanal fishermen organize cooperatives.[254] Three cooperatives (the St. John's, St. Mark's, and the Soubise Fishermen Associations) were formed in 1986.[255] The authors were unable to obtain information on the current status of Grenadian cooperatives, but they do not appear to play a major role in the fishing industry.

Photo 59.--The Grenville Street Fish Market is the most important in St George's. New facilities financed by the Japanese were under construction in 2001. D. Weidner

XII. Markets

A. Domestic

Fish marketing on Grenada until recently was fragmented and disorganized. It involved relatively large numbers of people handling relatively small quantities of fish. Landings were widely dispersed.[256] Traditionally the fishermen sold their catch fresh directly to consumers from their boats or in public markets. Fish was also marketed by vendors. Most of the catch is sold at the landing site or markets. In recent years Government-built fishery markets have become increasingly important in Grenada. The Grenadian fish markets are now a key component of seafood marketing on the island.[257] The markets are government-owned and operated. The Grenadian Government has built six major marketing centers on Grenada and one on Carriacou.[258] Employees of the FD supervise the private vendors buying and selling fish in the markets. The markets are all located adjacent to landing sites and many fishermen land their catch at these markets for sale. A fisherman can sell his catch himself, but after having spent all day fishing, most prefer to sell to vendors.[259] Vendors provide an easily accessible and constant outlet for the catch. Fishermen do not have refrigeration equipment on their vessels. Many do not even have ice holds. Thus most sell their catch as quickly as possible. They can use the cold stores provided by the Government at the various markets. This would, however, lower the value of their catch as Grenadian consumers prefer fresh product. The Grenadian domestic market primarily demands fresh fish. Fish purchased by vendors is either sold locally

Photo 60.--The Gouyave Fish Center is another important outlet for Grenadian fishermen. Large quantities of billfish are marketed here. Mark Farber

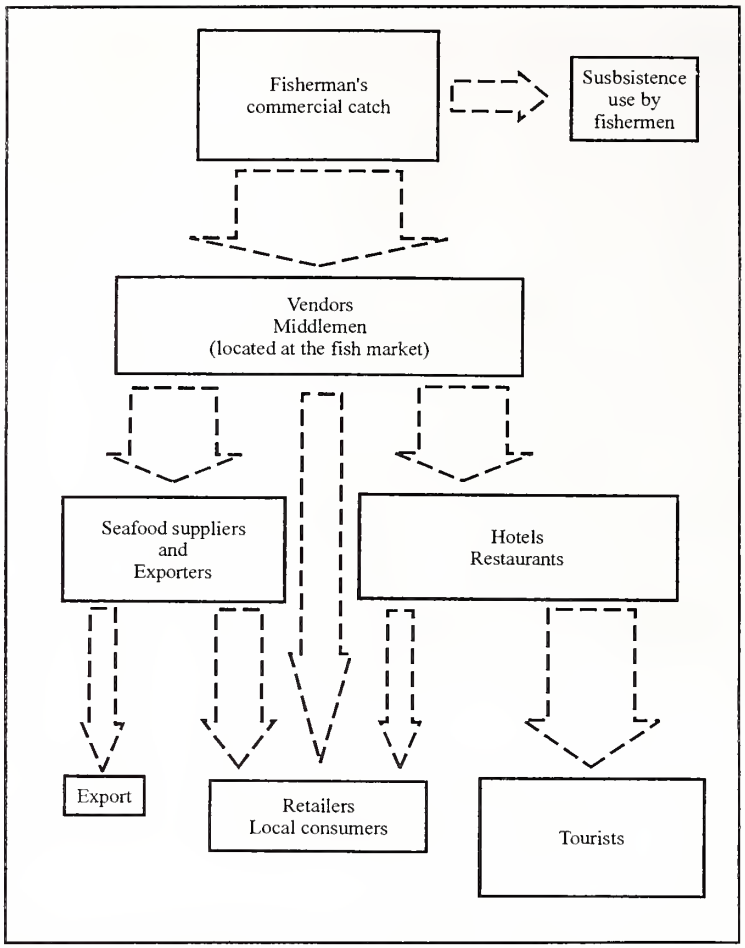


Figure 15.--This flow chart is a good view of how artisanal fishermen market their catch, but does not represent the pattern for the commercial longline fishermen. Jeffrey

or transported without ice in pickup trucks or even public transport for sales in major markets such as St. George's or Grenville.[260]

While the fish markets have become increasingly important in Grenada, there are a variety of domestic marketing channels. Many fishermen sell to vendors and middlemen who then sell to retailers, hotels and restaurants, and seafood suppliers and exporters (figure 15).[261] An exception is the pelagic fishery, especially the longline fishermen, many of who have working relations with the processing and exporting companies. As a result they will deliver their catch directly to those companies (figure 16).[262] Small-scale fishermen landing their catch at remote locations may use the catch for subsistence or sell their catch informally in local communities.[263]

The Government during the 1970s and 1980s maintained a controlled marketing system.[264] One observer believes that inefficient fishing operations were conducted during the PRG period that were only partially offset by Government subsidies. Price controls were introduced to try to maintain affordable prices.[265] The price controls encouraged some fishermen to withhold product from the domestic market or develop selling strategies such as requiring consumers to purchase less desirable species when buying popular species.[266] The Government abandoned the controlled price system in 1992.[267] Some of the larger markets have cold stores and ice-making plants, but as consumers prefer fresh fish, most of the preferred species are sold fresh daily.[268] The fishermen during the peak fishing season often limit fishing effort because of the limited domestic market.[269]

The marketing patterns of the various Grenadian fisheries differ significantly.

Ocean pelagic fishery: Artisanal fishermen report difficulties marketing their catch. Consumers do not desire some of the species taken and the size of the fish also complicate sales. Often they can not be immediately sold and must be stored and marketed later or in export markets.[270]

Beach seine fishery: The beach seine catch is easily sold in the domestic market. Both the species taken and the size of the fish are in demand among local consumers. While the beachseine fishery produces over half the country's

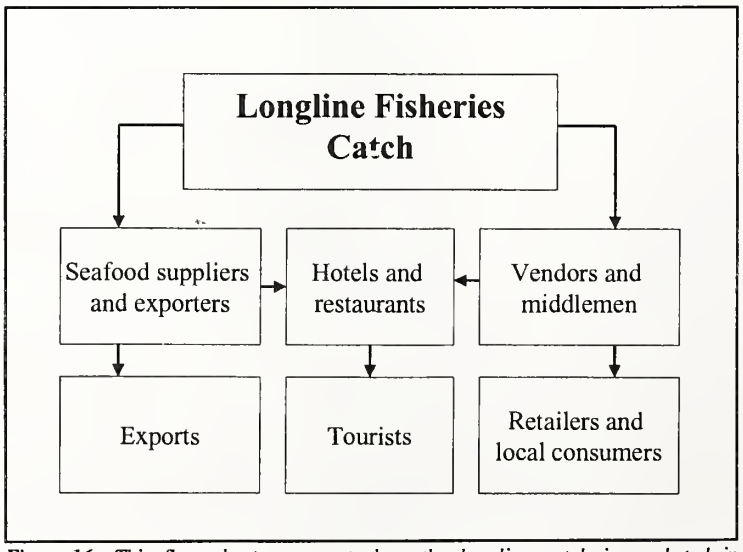


Figure 16.--This flow chart represents how the longline catch is marketed in Grenada. The tuna and swordfish is exported. The billfish and other species are consumed domestically.

catch, it supplies a much larger share of domestic consumption because the other fisheries export larger quantities of their catch.[271]

Shellfish: The artisanal divers gathering shellfish have developed their own distinct marketing strategy. Most of the catch is either sold to local hotels and restaurants or exported.[272]

Photo 61.--The catch of the longline fishermen is usually available in the Grenville Street Fish Market. This vendor has sailfish and swordfish for sale. Dennis Weidner

Longline fishery: Much of the catch of the developing longline fishery during the 1980s, both the targeted tuna and sailfish as well as the incidental catch, was sold in the local market.[273] This changed in the 1990s as the expanding fleet began to land more and better quality product. Some oceanic pelagics began to be marketed differently than most of the Grenadian catch. The pattern, however, varies by species.

Tuna: The tuna and swordfish catch of acceptable quality was mostly exported and thus not always available locally. Tuna still is now mostly exported, especially yellowfin.

Swordfish: Swordfish is taken in much smaller quantities than tuna and marketing practices vary. One company (GCFL) had such difficulties meeting U.S. import requirements that they ceased exporting swordfish. Other exporters (Caribbean Seafood and Seafood Ltd.) continue to ship swordfish and have obtained exemptions to the FDA automatic detention provisions. There is little or no processing of swordfish in Grenada. Almost all of the swordfish sold domestically is marketed fresh. The trunks are displayed in the markets and pieces are cut to order from the trunks for customers. Occasionally trunks are frozen if unusually large numbers of swordfish are landed and can not be immediately sold.[274] GCFL reports, however, a strong growing market for swordfish. Not only do tourist hotels and restaurants buy it, but the public at large has reportedly acquired a taste for it in recent years and swordfish

Photo 62.--Grilled marlin is a popular item at this and many other Grenadian restaurants. Dennis Weidner

now sells well in Grenadian fish markets.[275] One report indicates that increasing swordfish catches in 2000 has resulted in price declines in the local market.[276]

Billfish: The substantial billfish catch is largely marketed domestically. Blue marlin is the most valuable species, commanding the highest prices. Sailfish are landed in large quantities. Local consumers have reportedly developed a taste for sailfish ("ocean gar") and the fish are commonly available on the local market where it is sold fresh. The customer simply indicates the quantity desired which the merchants cuts off for him.[277]

Shark: The shark catch is also mostly sold in the domestic market.

Tourism is having an impact on Grenada's seafood market as it does throughout the Caribbean. Tourism is most important in the Leeward Islands which are more developed and closer to both the United States and Europe. The Windward Islands are less developed economically a located further south. Grenada is the least developed and most southerly of the Windward Islands. It has one of the smallest tourist industries, if not the smallest, in the Lesser Antilles. Even so, tourism has expanded significantly and is the most dynamic economic sector on the island. Tourism has affected the marine ecosystems of several Caribbean islands. One anticipated impact is expanded demand for seafood.[278] American tourists like to eat seafood on Caribbean vacations, often requesting species like shrimp which may not be available locally. As a result, there is a growing local demand for swordfish and other oceanic pelagics. Swordfish is another favorite of American tourists.

B. Trade

1. Exports

Artisanal fishermen export most of their shellfish catch and important quantities of the oceanic pelagic and demersal fish. Martinique is an especially important market. Some Grenadian fishermen land their catch directly in Martinique, but more of the catch appears to be transported aboard trading vessels.[279] Most of the catch marketed in Martinique are demersal species (snapper, parrot fish, and cavalli). Price controls which formerly existed in Grenada were a factor encouraging the fishermen to market their catch in Grenada. Good prices in Martinique, the islands location close to Carriacou and Petite Martinique, and the small local market, and limited cold storage on Carriacou and Petite Martinique have encouraged fishermen from the northern Grenadian islands to market fish in Martinique. The quantity of fish involved has amounted to substantially more than the quantity marketed in Grenada.[280] Grenadian officials, however, report that the Martinique market in recent years has become more competitive. Economic difficulties in Venezuela and the declining value of the Bolívar has encouraged some Venezuelan fishermen to turn to alternative export markets like Martinique.[281]

Grenada has exported little swordfish. The artisanal longliners rarely catch swordfish and the commercial longliners reported only a small catch. Thus there has been little product available to export. Grenada's small but growing tourist industry created a limited domestic market for the species at relatively good prices. The U.S. longline fishermen operating out of Grenada rarely landed their swordfish catch, but apparently transhipped over 5 t of swordfish during 1989 (appendix D2a1).[282]

Export patterns appear to be changing in Grenada. The small commercial longliners acquired from Japan are apparently catching small quantities of swordfish, probably explaining the approximately 3 t of swordfish exported to the United States in 1993 and 1994 (appendix D2a1). Several larger longliners were acquired in the late 1990s. Japanese fishing technicians have been working with the

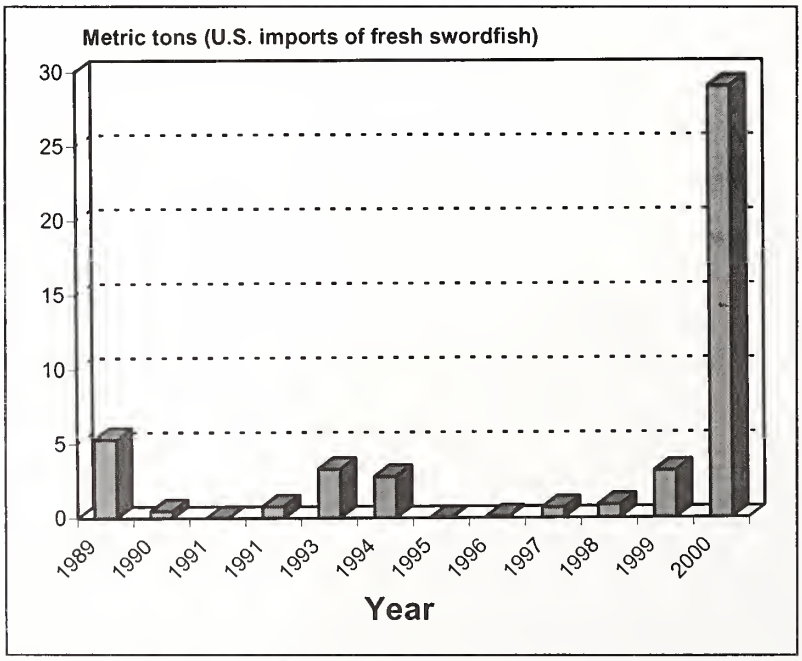


Figure 17.--Grenada swordfish shipments to the United States have been limited but increased sharply in 1999 and 2000.

fishermen, encouraging them to go further out and fish in deeper waters.[283] The result has been increasing swordfish catches, especially since 1997 (appendix C4). GCFL has encountered problems meeting U.S. import standards.[284] Other companies have obtained exemptions to the FDA automatic detention rule (appendix D4b). Certainly the profits from fresh tuna shipments to the United States has helped local companies develop and implement the necessary practices as well to meet U.S. import statistics. Grenadian swordfish shipments to the United States increased to 3.2 t in 1999, but beginning in March 2000, exporters initiated regular shipments to the United States (appendix D2b). Swordfish shipments in 2000 totaled nearly 33 t valued at almost $285,000 (appendices D2a1-2). Shipments in 2001 are also strong, but may not reach the levels reported in 2000.

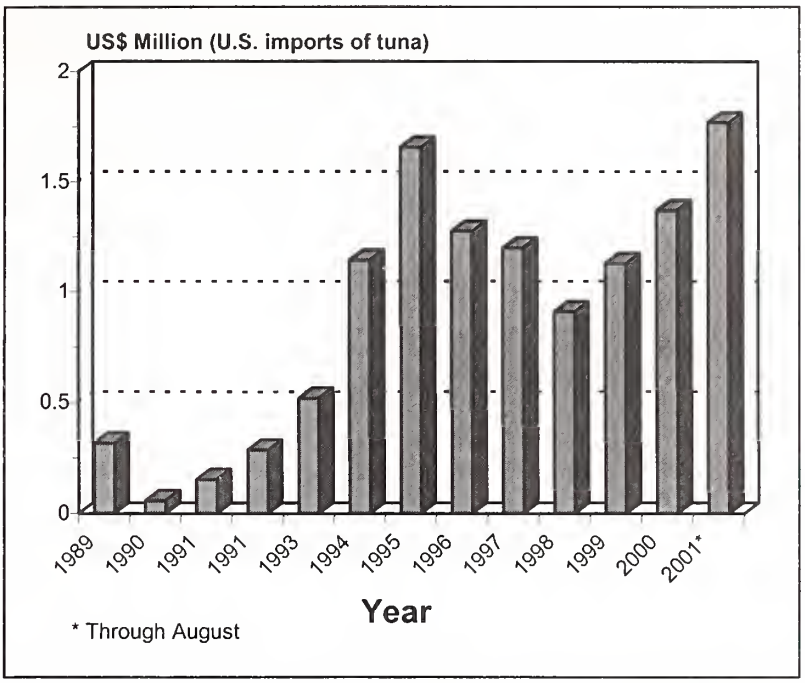


Figure 18.--Tuna is the primary longline target species and thus tuna shipments to the United States are a useful indicator of trends in the country's longline fishery.

The United States is currently the only country in which Grenada markets swordfish. Other major importing countries report no shipments from Grenada (appendix D1). The apparent prices of Grenadian shipments have fluctuated significantly during the 1990s (appendix D2a2). In part this is due to the small quantities shipped in some years, but the authors are unable to explain these fluctuations at this time.

Tuna remains a much more important market for Grenada. The longline fishermen are exporting their tuna catch, primarily yellowfin, mostly through GCFL. The United States since 1994 has been importing $0.9-1.7 million worth of tuna annually (appendix D3). CARICOM reports that yellowfin exports have been increasing because of the greater availability of ice and improved quality control procedures.[285] Tuna shipments to the United States, both fresh and frozen product, increased sharply after 1990, but peaked at $1.7 million in 1995. Shipments fell to only $0.9 million in 1998, but have increased to $1.2-1.3 million in 1999 and 2000 (appendix D3). This is still well below the record 1995 levels.

Photo 63.--Billfish is popular in Grenada and is imported to supply local demand. Imports mostly come from the bycatch of Taiwan-owned longliners operating from Trinidad. D. Weidner

Grenada's substantial billfish catch (sailfish and marlin) appears to be primarily marketed domestically. U.S. regulations prohibit

the importation of north Atlantic billfish (taken north of 5°N).[286] There are no record of billfish sales to Japan (appendix D1). There may be shipments to other islands, but no data is available. As shipments to the United States are not possible, it appears that the billfish is primarily consumed in the domestic market. Billfish is commonly available in Grenadian fish markets.

Grenada exporters handling tuna and swordfish appear to have two difficulties:

Air freight: Exporters frequently have difficulty finding air cargo space because of the limited number of flights.[287] This is a major problem for a company shipping fresh product. Delays can significantly affect the quality of the product.

Product quality: Some Grenadian swordfish shipments have been detained by FDA. as a result GCFL no longer exports swordfish to the United States.[288] Recently FDA has detained shipments Seafood Ltd. (Alex Swan) and Mervyn James (appendix D4a). The authors have little information on James, but the Seafood Ltd. shipments may have been associated with efforts to qualify for an automatic detention exemption which it succeeded in doing. Caribbean Seafood has had the exemption for several years (appendix D4b).

2. Imports

Grenada imports relatively little seafood, although some canned fish and cured (salted and smoked) fish is imported. The most important cured import has been cod. In recent years, the major import has been shrimp from Barbados, Trinidad, and Guyana. The imports are mostly small shipments arranged by restaurants, hotels, and supermarkets. There are no swordfish imports.[289] There are, however, billfish imports appearing in the local market. This appears to be the bycatch of Asian longliners, probably the Taiwan longliners operating out of Port of Spain, Trinidad. One local observer reports that the Japanese company Mitsubishi is making the arrangements.[290]

XIII. Government Policy

The Grenadian agency responsible for fisheries is the Fisheries Division (FD) of the Ministry of Agriculture, Lands, Forestry, and Fisheries.

A. Fisheries law

Grenada in the mid-1980s reportedly preparing a new comprehensive Fisheries Law to provide for fisheries management and guidance to private groups entering the industry.[291] The country's general fisheries legislation, the Fisheries Act was enacted in 1986 and the implementing regulations in 1987.[292] The Grenadian laws and regulations have been harmonized with those of other OECS members.[293] Grenadian officials indicate that they are satisfied with the harmonized law promoted by the OECS. They note that Grenada can implement more restrictive regulations if needed. Grenada has, for example, passed vessel safety regulations that provide greater security to Grenadian fishermen than those recommended by OECS.[294]

B. Limits

Grenada passed two laws in 1978 which established its marine limits. Grenada claimed a 12-mile Territorial Sea in 1978.[295] At the same time Grenada claimed a 200-mile Exclusive Economic Zone (EEZ).[296] The United States in 1982 protested certain aspects of the Grenadian claim. Grenada signed the Law of the Seas Convention in 1982 and ratified it in 1991. The Government in 1990 merged the two 1978 laws concerning marine limits into one comprehensive law.[297] The primary difference was the 1990 law gave Grenada the authority to proclaim archipelagic status. The Ministry of External Affairs is responsible for administering the 1990 Act.

C. Licenses

1. Domestic fishermen

Grenada has an open, unlimited access policy concerning fishery resources.[298] All Grenadian fishermen, except beach seine fishermen working inshore waters, are required to obtain Government licenses. The cost of the license varies, depending on the vessel size. Small boats (up to 30 ft/9 m) are charged EC$5 (US$1.86). Medium sized boats (30-60 ft/9-18 m) are charged EC$15 (US$5.58). Larger vessels (over 60 ft/18 m) are charged EC$60 (US$22.30).[299] The licensing regulations, however,

are not strictly enforced.[300] The authors also noticed a number of boats that do not even have their names painted on them.

Sport fishing also requires a license. This requirement, however, is not generally enforced, except during the Spice Island Billfish Tournament. The charter boat operators have to obtain a boat license.[301] This is primarily a safety requirement and not a special requirement for fishermen.

2. Foreign fishermen

A 1986 law included provisions for licensing foreign fishermen. Special exceptions were provided for test fishing and locally based, but foreign-owned vessels.[302] The Government began issuing licenses in 1988

1988: The Government approved licenses for foreign fishermen in 1988, but the action was sharply criticized by local fishermen.[303] The authors have received varying reports in the number of licenses issued. The discrepancies are in part due to the fact that some of the U.S. longliners involved qualified for domestic licenses because of local equity participation. One report indicated that two of the three licenses issued in January, 1988, were issued to U.S. Merit Seafood (*Mandy J* and *White Seal*).[304] Other sources report that as many as eight U.S. longliners were working out of Grenada. The licensing arrangements for these vessels differed. Fully U.S.-owned vessels had to obtain foreign fishing licenses which allowed them to fish in Grenadian waters and land in Grenadian ports. Some of the vessels, however, had some local participation and they were allowed to operate with domestic fishing licenses.[305] Confusion concerning this partial local ownership provision was to eventually lead to seizure of some of the vessels and protracted litigation.[306] The issuing of the licenses resulted in considerable political controversy and debate in the local press.[307] The Government required fishermen receiving licenses to hire Grenadian trainees and to land their bycatch in Grenada. Officials were disappointed with the quantities of bycatch actually landed and complained that the fishermen were discarding much of it at sea.[308] Government officials estimated that the fishermen landed about 45 t of tuna and swordfish per vessel worth about $0.5 million during a 3-month period at the beginning of 1988.[309] The Grenadian Government received royalties of about $30,000 per vessel.[310] The Government as a result of press criticism was reportedly considering a moratorium on further licenses. Government officials in 1988 were reportedly also debating whether to issue licenses independently of other Eastern Caribbean island countries or to participate in a OECS harmonized licensing scheme. Some officials contended that Grenada has "more fish" to offer foreign fishermen who would thus "flock to Grenada". Thus some officials insisted that Grenada should maintain an independent licensing scheme.[311] The Grenadian Government, however, at an OECS head of government meeting (St. Lucia, November, 1988) indicated a more moderate position on the harmonized licensing scheme.[312]

1989: The Grenadian Government in 1989 reportedly only renewed one of the three licenses issued in 1988, but issued licenses for two other vessels.[313]

1990-95: The Grenadian Government has issued no licenses to foreign fishermen (appendix E).[314]

1996-2000: No information available.

Photo 64.--Several Grenadian longliners in 1999 did not have the names painted on the bow or stern, making them difficult to identify. D. Weidner

D. Regulations

Grenadian fisheries are essentially unregulated. The fishery has historically operated under the open entry, common property approach. This is comparable to other largely artisanal fisheries in the Caribbean and other regions. The Government has sought to expand, not limit, fishing effort. Only when stocks become threatened has the Government issued management regulations.[315] While regulations have been issued on lobsters, turtles, urchins, and conchs, there are none on any finfish.

Grenada has no fishing regulations pertaining to longlining. There are no minimum size or gear restrictions.[316] In fact the Government has been especially interested in expanding rather than restricting the longline and other pelagic fisheries.[317] The ICCAT management regimes have not been implemented. There are also no regulations on sport fishing.

E. Promotion

Grenadian officials and the public in general have traditionally considered fishing to be a marginal activity. Artisanal fishermen for the most part eked out only marginal incomes. Despite having access to productive grounds and favorable oceanographic conditions, artisanal fishing craft and traditional equipment and methods limited the ability of local fishermen to utilize the available resource. An inadequate marketing structure was another limiting factor.[318]

The Grenadian Government in the early 1980s began to give greater priority to promoting fisheries development. The Fisheries Division has initiated a development strategy designed to: 1) create a resource management infrastructure and improve shore facilities, 2) initiate an artisanal development project, 3) initiate a resource management program, and 4) develop a large-boat offshore fleet.[319] The Government is especially concerned with expanding effort on still lightly fished pelagic stocks and in improving the marketing system.[320] The Government set up the National Fisheries Company, provided duty-free import of engines and spare parts, a low-interest loan program, fuel rebates, established the Grenada Fisheries School at True Blue, and provided support services such as cold stores and chill rooms.[321] Fishermen also qualify for a fuel rebate as long as they maintain operations above a proscribed minimum.[322] Some fishermen and companies report difficulties in actually obtaining rebates on the duty free provisions.[323] The FD's Artisanal Fisheries Development Project (AFDP) in 1985 was studying the possibility of deep-sea longlining for swordfish.[324]

The Government's principal fisheries development effort has been the Artisanal Fisheries Development Project (AFDP), a 5-year project which was initiated in 1982. the project included several components including fishing gear and methods and marketing. Longlining was one of the methods promoted. One of the most important components of the program was a loan program enabling artisanal fishermen to buy their own boats. Before the AFDP, 80-90 percent of the fishermen were contracting the use of their boats. Many of the loans were for small longliners and longline gear, mostly from fishermen along the west coast.[325] The staff and some of the AFDP program was merged into the current GCFL.

The artisanal longline fishermen by 1988 had began deploying small longlines, many obtained

Photo 65.--Japan has financed several major fishery projects on Grenada. One of the largest was the state-owned GCFL plant and pier at Grand Mal north of St. George's. Dennis Weidner

through AFDP loans. The longlines they deployed averaged about 1.6 kilometers.[326] The Government encouraged the fishermen to diversify into longlining. Small Government loans were offered at attractive interest rates. The gear could be imported duty free and fuel subsidies (reimbursements) eased the shift to more energy intensive operations.[327] The shift to longlining has proven profitable. Many fishermen report that they have substantially increased their income.[328]

Many fishery managers in the Caribbean are encouraging fishermen to switch from traditional fisheries, often conducted along the coast, and pursue offshore fisheries on less heavily fished pelagic stocks. One observer is critical of the current direction of the Grenadian fishing industry. University of Houston Geographer Michael Doran believes that the current style of sleek pirogues and costly motors, as well as even more expensive longliners, are not cost effective. He reports that once about 5 percent of Grenadians participated in fisheries. Currently the cost of buying a boat and motor preclude many from entering the fishery. In addition, expensive spare parts and fuel are actually reducing the income garnered. He is working with boat builders to design a fishing boat that can be operated with sails. He hopes to test two prototypes in Grenada.[329]

F. Marine parks

Grenada has a less developed park system than some other Caribbean countries. The legislative basis for parks and reserves is particularly weak in Grenada.[330] Levera National Park's lagoon and mangroves are one of the most important wildlife habitats on the island.[331] Reserves are also being considered at Sandy and White Islands. These reserves like sport fishing are important attractions for the island's expanding tourist industry.[332]

G. Environmental policy

Some observers see an increased in grass roots environmental awareness in Grenada. Although turtles are still harvested, there is growing interest on Grenada in protecting them. Grenada's national parks have proven very popular. One Grenadian believes, however, that this increased environmental awareness is not being reflected in government actions and policies. Grenada is actively trying to develop its tourist industry by seeking more visitors, cruise ship visitations, and building more hotels. Such actions would eventually lead to greater pressures on coastal resources including fisheries. Also Grenada's close association with Asian fishing interests (Japan and Taiwan) is seen by some Grenadians as alarming. They are concerned about what is perceived as a lack of communication on environmental issues and irresponsible exploitation of fishery resources exhibited by some fishermen from these countries.[333]

Grenada's predicament on environmental issues is not different from other south-eastern Caribbean islands. The recent decline of world market prices for bananas, cocoa, and nutmeg (Grenada's chief agricultural export) along with the U.S. pressure on the European Union to open its banana market to Dole and Chiquita bananas has had a substantial impact on Grenada's local economy. This has in fact created much anti-American sentiment in the southeast Caribbean. One Grenadian observer knows of many successful farmers who have had to abandon their banana farms because they were no longer profitable. Some have shifted to fishing or the tourism industry, creating more pressure on coastal resources. He contends, "I believe that the U.S. foreign policy may be hampering the development of a strong environmental conservation policy in the eastern Caribbean region."[334]

XIV. Research

Grenada has no formal fisheries research program. Some surveys have been conducted and data such as size/length frequencies collected. Attention has focused on the demersal shelf resources, but in recent years officials have shown greater interest in pelagic resources. The most significant stock assessment work was conducted by the Soviets during the early 1980s to assess resources on the country's shelf.[335]

Grenadian research on swordfish and other oceanic pelagics is limited.

Fisheries Division: The Fisheries Division (FD) in the Ministry of Agriculture, Lands, Forestry, and Fisheries (MALFF) have done some studies on oceanic pelagics.[336] They have collected billfish data as part of the ICCAT Programme for Enhanced Research on Billfish. The data is collected through port sampling of artisanal and recreational fisheries as well as more limited at sea sampling.[337] The Ministry is cooperating with ICCAT on this project and hopes to do some at sea sampling aboard the new longliners obtained in Japan.[338] Plans in 1994 called for using one of the vessels to initiate sets using live bait to increase the number of billfish for tag and release studies.[339] MALFF researchers during the 1993/94 billfish season sampled 842 billfish, including sailfish (783), blue marlin (49), and white marlin (10). An additional 45 billfish (mostly sailfish) were sampled at the Spice Island Billfish Tournament in 1994.[340] Shore based sampling of the artisanal fishery for pelagics continued during 1996.[341] The FD has done some work with FADs and the Japanese have provided financial assistance for the project. One FAD was reportedly successful in attracting dorado, sailfish, wahoo, and marlin. The project was reportedly cut short when the FAD was hit by a ship. ICCAT researchers in 1991 were hopeful that with the acquisition of one of the Japanese-donated longliners that the DF could initiate experimental longline work. One researcher was preparing a study relating physical and biological oceanographic parameters to longline catches. It was also hoped that the DF could investigate possible fishing techniques, including the use of different baits, to minimize billfish catches while maintaining yellowfin tuna catches.[342] To the authors knowledge, such studies were never conducted and billfish continues to be an important part of the Grenadian longline catch.

Ocean Spirits: Ocean Spirits is a non-governmental organization (NGO) in Grenada. Their activities are focused on the conservation of sea turtles. They believe that "the protection of natural resources comes through working hand in hand with the local community". Ocean Spirits has begun an ecotourism project, taking tourists to watch the leatherback turtles lay their eggs on beaches in the north of the island. They have also sponsored a research project to determine the level of nesting at two key beaches. They hope to reduce the level of egg poaching which they estimate at about 70 percent in 2000--clearly unsustainable.[343] Ocean Spirits also carry out workshops and field trips in schools which are aimed at increasing the awareness of youth to sea turtle and endangered species/habitat issues.[344] While the Ocean Spirits group is making a valuable contribution to the understanding of nesting activity, the authors know of no Grenadian research group addressing the issue of longline interactions with turtles.

Other: The authors know of no active marine research institute on Grenada.

International organizations and foreign research institutes have provided some assistance with collecting data needed for research and management. This has included work on both oceanography and fisheries.

CARICOM: Grenada is a member of the Caribbean Community (CARICOM). The principal CARICOM fisheries program is has been CFRAMP, but the CFRAMP program will end in 2001. It will be replaced by CRFM.

CFRAMP: Grenada participated in CARICOM's Fisheries Resource Assessment and Management Program (CFRAMP). The DF supported CFRAMP and worked closely with it. CFRAMP tried to collect data on the principal eastern Caribbean stocks that member countries can use for management decisions. The overall CFRAMP program is discussed in the Trinidad chapter of this report.[345] CFRAMP carried out research projects on length frequency, tag and release, aging, maturity, and sex on a variety of demersal and pelagic (dorado, tunas, wahoo, king mackerel, and others) stocks.[346] CFRAMP initiated a biological data collection program for large pelagics in 1995.[347] Some regional work was reported on yellowfin tuna.[348] CFRAMP has also looked at the role of drifting objects in pelagic fisheries and the potential for FADs.[349] Grenada actively participated in the CFRAMP program.[350] The program was, however, sharply curtailed in 1998-99. CFRAMP focussed primarily on small pelagics. Grenada is one of the few countries that expressed an interest in swordfish to CFRAMP.[351]

CFRM: CFRM will replace the CFRAMP program in 2001. It will presumably continue the CFRAMP

Photo 66.--Some species composition data has been published, but the authors know of no published reports assessing the bycatch of the Grenadian longline fleet. Dennis Weidner

research program. The CFRM mandate, however, is much broader than just research. (See "XVI. International".)[352]

Estación de Investigaciones Marinas de Margarita: The Venezuelan Estación de Investigaciones Marinas de Margarita (EDIMAR) has done oceanographic work around the islands of the southern Lesser Antilles.[353] EDIMAR has also done a great deal of fisheries work. The authors know of no work on swordfish, but there has been some work on tuna, significantly adding to the information available on tunas in the southeastern Caribbean as a whole.[354]

ICCAT: The International Commission for the Conservation of Atlantic Tunas (ICCAT) began working with officials from the Ministry of Agriculture during the late-1980s as part of the ICCAT Enhanced Research Program for Billfish (ERPB). ICCAT has been sampling the billfish catch in recent years.[355] ICCAT officials verified historical catch data and worked with Agriculture Ministry officials to expand shore-based sampling.[356] As a result, shore-based sampling of the artisanal pelagic fleet for size and sex data was conducted. During a 6-month period of 1990-91, for example, more than 1,000 size frequency measurements were taken.[357] Problems were encountered in sampling at sea because of the small size of the longliners which made it difficult to accommodate the samplers.[358] ERPB program participants also assisted in obtaining information on tag recaptures.[359] Sailfish tagging was planned, but the effort was limited by budget constraints.[360] ICCAT reported that shore-based sampling of billfish for size and sex data continued in 1994 and 1995 and tag returns were obtained on billfish.[361] Some ICCAT tagging work was reported aboard small longliners on neighboring St. Vincent to the north.[362] (See the St. Vincent chapter of this report for details.) Grenada continues to work with the ERPB and collected data from sports fishing tournaments. Commercial data was also sampled to obtain size frequency data.[363]

NMFS/NOAA: The National Oceanic and Atmospheric Administration (NOAA) has done extensive oceanographic research throughout the Caribbean.[364] NOAA's National Weather Service (NWS) is the principal agency involved with tracking the hurricanes that move into the Caribbean each year. NOAA's National Marine Fisheries Service (NMFS) through the Southeast Fisheries Science Center (F/SEC) does extensive work on many species of importance to Grenadian fishermen, although the authors know of no specific F/SEC work on oceanic pelagics off Grenada. NMFS researchers have taken samples of billfish and collected data at recreational tournaments.[365]

Universidad de Oriente: The Venezuelan Instituto Oceanográfico (IO) at the Universidad de Oriente in Cumaná has done substantial work on oceanography in the southeastern Caribbean around Grenada and the other islands.[366] IO biologists have also worked on fisheries, including swordfish and other highly migratory species. Much of this work is helpful in understanding swordfish behavior and trends around the islands of the Lesser Antilles.[367]

XV. Bycatch

Little information exists on the bycatch taken by Grenadian longliners. The authors have been unable to find any published study on the Grenadian bycatch. Some data is available because what U.S. fishermen classify as bycatch are species targeted by Grenadian longline fishermen and make up an important part of the catch. The western central Atlantic is known to have significant concentrations of billfish and both domestic and foreign fishermen take billfish.[368] Some data is available on the billfish take because it is reported in the fisheries data. Much of the foreign billfish catch is incidental to tuna and swordfish operations. The Grenadian fishermen, however, while primarily targeting tuna secondarily target billfish which is reflected in the catch statistics (appendix C5). The preferred target species are yellowfin tuna (*Thunnus albacares*) and blue marlin (*Makaira nigricans*) because of the higher prices received.[369] While not the preferred species, the fishermen report substantial landings of sailfish (*Istiophorus platypterus*), which they refer to as "ocean gar" (appendix C5). Only limited data on the actual catch composition is available. Much less information is available on the non-fisheries bycatch of species like turtles, marine mammals, and seabirds.

The authors know of no Grenadian study assessing fisheries bycatch or interactions with non-fishery species like turtles, marine mammals, and seabirds.

Grenada: Grenadian researchers have not addressed the bycatch issue. The authors know of no published reports on bycatch nor is there any observer program collecting data. This is the general pattern in the Caribbean. Grenada has only a minor fisheries research program which has hardly addressed species Grenadian fishermen target, let alone bycatch species.

Asian and Spanish longliners: The authors know of no detailed studies published describing the bycatch of the Asian and Spanish longline fleets in the wider-Caribbean on the Atlantic. Nor are there any publicly acknowledged observer programs. There is some indication, however, that limited observer data may have collected and a few studies are beginning to appear.[370]

United States: U.S. commercial longline fishermen targeting tuna and swordfish in the 1980s reportedly landed the billfish bycatch in Grenada.[371] U.S. fishermen receiving Grenadian licenses in 1988 and 1989 were required to land their bycatch in Grenada. Grenadian officials complained, however, that the fishermen were discarding most of the bycatch at sea.[372] Some idea of Caribbean bycatch trends are available by assessing the data reported by the U.S. longline fleet in its Caribbean operations (Puerto Rico, appendices G1a-b).[373] While this data does not pertain specifically to Grenadian waters or fishing strategies used by Grenadian fishermen, it does provide potentially useful benchmark data. The small U.S. observer program provides other useful data on bycatch. This is especially true as in recent years Grenadian fishermen have increasingly adopted American-style fishing techniques with monofilament line and acquired some medium-sized longliners.

Venezuela: Substantial Venezuelan fishing is reported in the Caribbean to the east of Venezuela. As a result, the limited information available on Venezuelan bycatches provide some insights on potential Grenadian bycatches.[374]

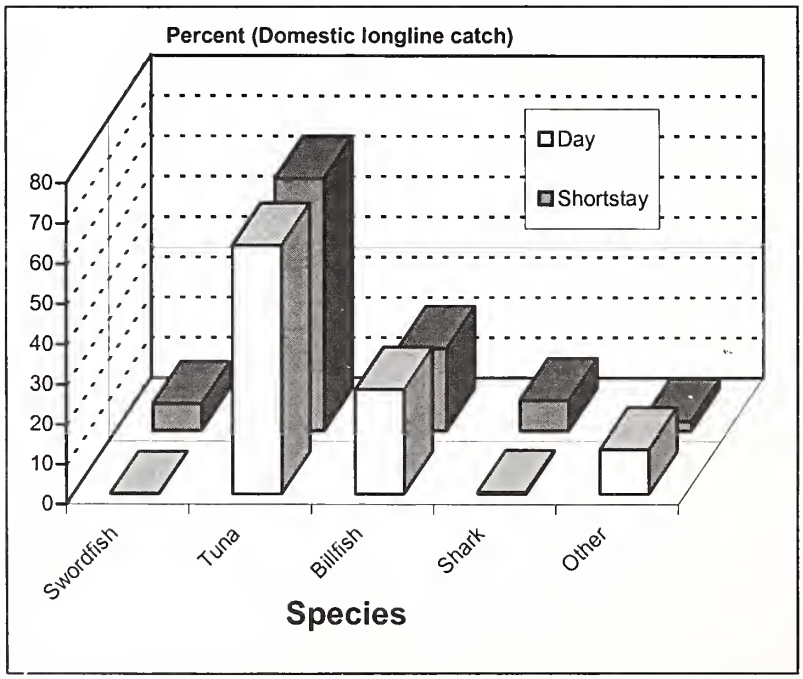


Figure 19.--Available data suggests that while the day and short-stay Grenadian longliners report similar tuna catches, there are substantial differences in the composition of the rest of the catch.

A. Tuna

Tuna occurs in the wider Caribbean in substantial quantities. One FAO assessment in 1985 suggested that about 600 t of tuna could be harvested per 1° square in the southern Caribbean.[375] Yellowfin tuna is the principal pelagic species taken by Grenadian longline fishermen. Even before the Grenadian longline fleet was expanded with the addition of the Japanese longliners during the early 1990s, yellowfin tuna along with blue marlin were the principal target species and not a bycatch.[376]

Tuna in the case of the Grenadian longline fishermen is the target species and the principal species taken. Some estimates suggest that tuna can make up 80-90 percent of the longline catch (appendix C2). Data compiled in the early 1990s with representative vessels suggested that tuna comprised about 60 percent of the catch (appendices B2-3).

Yellowfin: Most fishermen report that yellowfin is the bulk of the catch.[377] The limited catch composition data show that tuna, primarily yellowfin, dominates the catch of the both the day and short-stay Grenadian longliners. One official reports that yellowfin can account for 80 percent of the catch.[378] Another observer reports that 85-90 percent of the value of a longliners catch can be yellowfin.[379] Yellowfin is a smaller proportion of the overall pelagic catch in Grenada, but still the most important species taken (appendix C2). Yellowfin catches in the 1990s exceeded 300 t annually, except in 1996 when an usually small catch was reported. There are substantial annual variations in the fishery. The catch peaked at 490 t in 1993.[380] Fishermen in 1993 reported increasing CPUEs probably due to the increasing fishing power of the fleet.[381] The catch was about 350 t in 1998 and nearly 430 t in 1999 (appendix C3). One Grenadian company, however, reports that yellowfin has been less abundant in recent years and that sizes have been declining.[382]

Blackfin: Blackfin is of some importance and is taken in considerable quantities.[383] Blackfin catches have exceeded 250 t (appendix C3). The 1999 catch, however, was under 80 t. Blackfin is not exported, however, and thus is much less valuable than the yellowfin.

Bigeye: Small quantities of other tuna are also taken such as bigeye.[384]

The longline tuna catch is of considerable economic importance because it is a valuable export commodity. Yellowfin is the principal species exported by Grenadian companies.[385] Much of the yellowfin catch is shipped fresh to the United States (appendix D3). Shipments of $1-2 million annually are of some significance in the small Grenadian economy. Export shipments also appear to have peaked in the mid-1990s. Tuna export shipments to the United States peaked at 416 t in 1995 (appendix D3).

B. Billfish

Billfish is not a bycatch, but a principal target species for Grenadian fishermen. Grenadian longline fishermen take sailfish and both blue and white marlin. Grenadian fishermen have been regularly taking 200-300 t of billfish. Although not a massive amount, combined with the fisheries of neighboring states, including Venezuela, the combined quantities are of some consequence.

Blue marlin: Blue marlin is especially prized because of the high market price that it commands. Catches in the 1990s varied erratically from 26-64 t annually, except in 1999 when a record 100 t catch was reported (appendix C5). The 1999 catch was 100 tons. Catches in

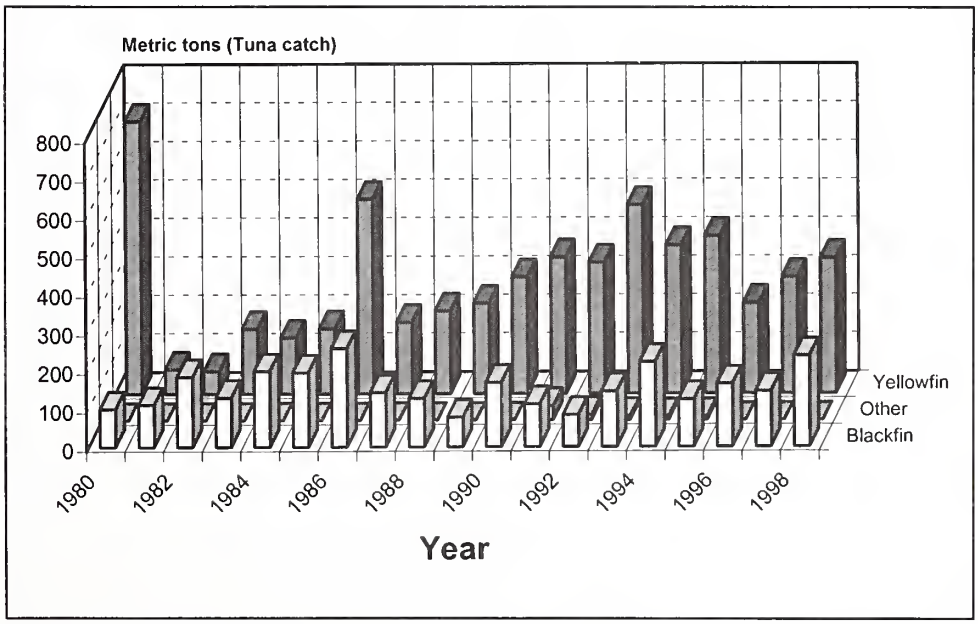


Figure 20.--Grenadian fishermen report taking mostly yellowfin and blackfin. Much of the longline catch is yellowfin.

the 1990s were much higher than in previous years, but this is because of the increased longline effort.

Sailfish: The major species taken, however, is sailfish. While the fishermen may prefer catches of tuna and marlin because of high prices, a very substantial part of the catch is commonly sailfish. Given the importance of the sailfish catch, some observers report that this billfish is targeted.[386] Sailfish is clearly not an incidental catch as the fishermen land more sailfish than any other species other than the targeted tuna. Sailfish catches have since 1985 generally been above 100 t, occasionally exceeding 300 t (appendix C5), again presumably reflecting increasing longline effort. Poor catches under 100 t were reported in 1996-97, but the 1999 catch was nearly 150 tons. This pattern is similar to that for yellowfin (appendix C3) and may reflect effort and operational trends in the fishery rather than species abundance.

The limited available catch composition data is not species specific. It shows the day longliners took a higher proportion of billfish (25 percent) than the short-stay longliners (20 percent) (appendices B2-3, and 5). FD researchers in 1991 were studying experimental techniques (such as varying bait) to reduce the billfish by catch.[387] The species composition of the billfish catch appears to be changing in recent years. Sailfish catches during the 1980s could be 15 times greater than blue marlin catches and were commonly three times greater. Blue marlin catches have been increasing in the 1990s and sailfish catches declining--although the pattern is erratic (appendix C5). The sailfish catch in 1999 was only 50 percent greater than the blue marlin catch. Population trends may be involved, but the changing nature of the Grenadian longline fleet and fishing operations are probably also important factors.

Fishermen operating out of the principal west coast (Caribbean) ports of St. George's and Gouyave report substantial billfish catches, mostly sailfish. Only minimal billfish catches are reported by fishermen operating from Grenville along the island's eastern coast. Interestingly, the fishermen report that billfish catches are highly variable. Fishermen along the western coast from St. George's and Gouyave can report highly varied catches, with one group reporting minimal catches and the other at the same time reporting excellent catches. One report speculates that sailfish may aggregate in a small area off the western coast which in different years in more accessible to the fishermen from the two ports.[388]

Grenadian longline fishermen report a much higher level of billfish catches than reported by U.S. fishermen operating in the Caribbean area. The U.S. fishermen in 1993, for example, reported billfish catches of only about 5 percent (Puerto Rico, appendix G1b), a fraction of the 20-25 percent reported by Grenadian fishermen (appendix B5). The variations of course reflect a variety of factors, including different fishing strategies, gear, grounds, seasonal effort, and other factors.

The authors have no data on how billfish are being utilized on Grenada. The authors have noted billfish for sale in fishery markets. We believe that most of the catch is sold fresh in these markets. Grilled marlin and other billfish dishes are common menu items in Grenadian restaurants.

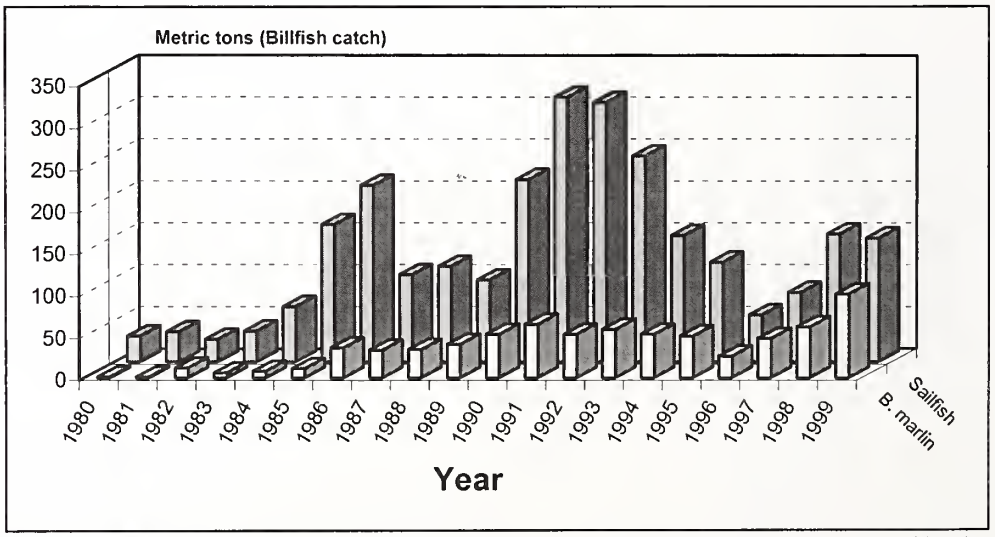


Figure 21.--The principal billfish species taken by Grenadian longliners is sailfish. They also report a blue (but no white) marlin catch. The sports fishermen, however, do report white marlin catches.

C. Sharks

Grenadian longline fishermen also report a shark bycatch. ICCAT in 1995 initiated efforts to collect information on shark bycatches associated in fisheries for tuna and related species. Grenadian officials reported a shark bycatch of only 7 t to ICCAT in 1995.[389] This total should include all sharks caught even if not landed. The authors are not sure, however, whether the data submitted by the DF to ICCAT is total catch or just landed fish.

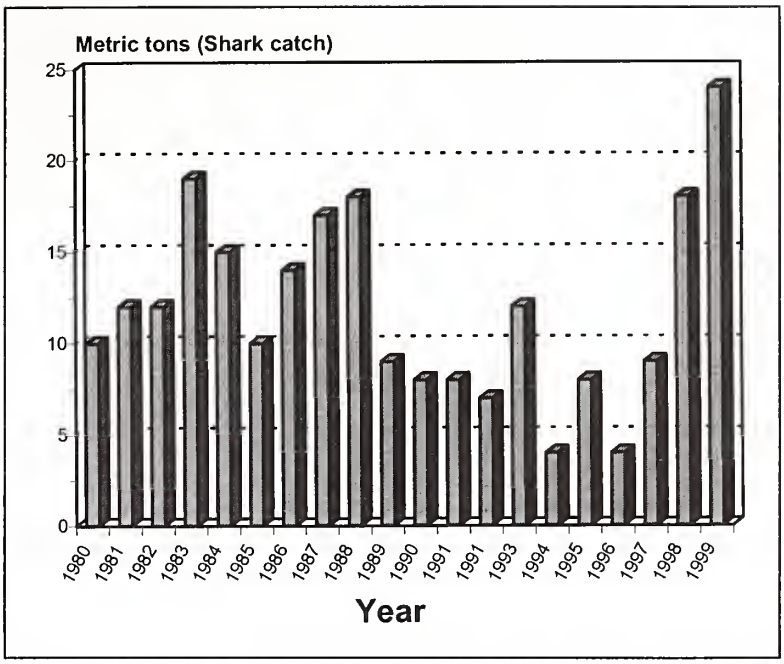


Figure 22.--Grenadian shark catches are small and have fallen in recent years, although there was an increase in 1998 and 1999. Reported catches may not include the bycatch discarded at sea.

There appears to be a substantial difference between the shark bycatch reported by the day and short-stay longliners. The day longliners report only a minimal shark by catch while the short-stay longliners report about a 7-8 percent shark bycatch (appendices B2-3 and 5). The authors are unsure why the day longliners report such low shark bycatches.[390] The short-stay longliners report shark catch levels comparable to those reported by the U.S. longliners operating in the Caribbean area (Puerto Rico, appendix G1b).

Grenada reports only a small shark catch to FAO. In fact the 7 t reported to ICCAT as a bycatch is virtually the same as the 8 t reported to FAO as the overall catch (appendix C6). It is not clear to what extent the FD includes the longline bycatch in the fisheries catch data reported to FAO. The DF may not be adding shark discards into the regular fisheries catch. Two factors suggest that this may be the case.

Catch patterns: Curiously the Grenadian shark catch does not appear to have increased in recent years with the expansion of the longline fishery. In fact, catches since 1988 declined (appendix C6). If tuna catches increased as much as reported, surely the incidental shark bycatch would have also increased. Officials did report a notable increase in the shark catch to 18 t in 1998 and 24 t in 1999 (appendix C6).

Data collection: The authors are not sure how discards at sea would be calculated as Grenadian fisheries data is based on estimates of landings taken at shore sites.

Photo 67.--Shark trunks are commonly seen in Grenadian markets, but shark is some of the least expensive fish. D. Weidner

Thus compiling data on sharks discarded at sea would be very difficult.

The authors observed shark readily available in the local market during a 1999 visit. Shark does not, however, seem to be very popular with Grenadian consumers. Prices for many species are quite low and the fish is sometimes used as dog food.[391] While the Grenadians have acquired a taste for billfish since the initiation of the longline fishery, the same can not be said for shark.

The authors have no data on the species of sharks being taken by the Grenada fishermen. The Grenada report to ICCAT on shark bycatches contained only a total marked "unspecified".[392] U.S. longline fishermen operating in the Caribbean during 1993 reported mostly blue and silky sharks (Puerto Rico, appendix G1b). The differing operations and range of the two fleets, however, mean that the species composition could be substantially different.

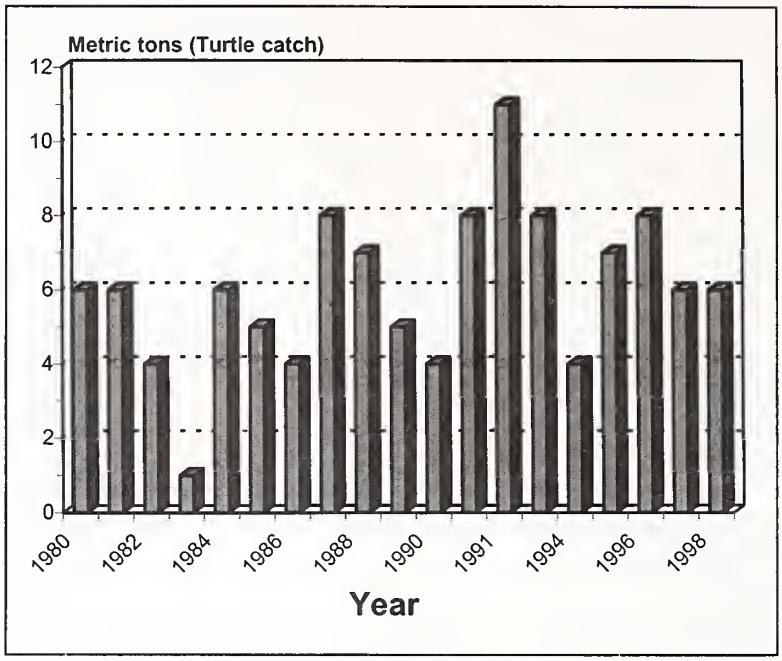


Figure 23.--Grenadian turtle harvests have fluctuated in recent years, but overall there has been no significant change in the reported harvest.

The authors have received varying reports regarding the practice of finning sharks. One official reported that most sharks are finned to retain the valuable fins and the carcasses discarded. He indicates that usually the makos are retained, the other species are reportedly finned and discarded.[393] Other sources report that finning is not common and the few sharks caught are landed.[394] Little data is available.

D. Other finfish

The longline catch includes dorado ("dolphinfish"), blackfin tuna, shark, and kingfish/wahoo.[395] These species are also taken in the troll fishery on the windward shelf edge (figure 8).

E. Turtles

Grenadian officials report that green, hawksbill, and leatherback turtles nest, mostly along the northeast and southeast coast and on the offshore islands.[396] Researchers have reported a notable lack of information as to the population status of turtles off Grenada. A turtle researcher on Grenada reports that hawksbills and leatherbacks nest and that greens and hawksbills forage off Grenada.[397] Loggerheads are also known to be present in the water off Grenada. Some nesting sites are protected within Levera National Park.[398] Green turtles tagged in Bermuda have been recovered at Carriacou, a Grenadian island in the Grenadines, as well as other sites in the Caribbean--especially Cuba.[399]

Turtles have been traditionally caught on Grenada, although the authors have no historical accounts describing the nature of the traditional fishery. One Grenadian report does indicate that turtles have been used as a food source for hundreds of years.[400] Turtles have been taken by the local fishermen and the eggs were collected on the nesting beaches. A 1990 report prepared by the U.S. Embassy using Government sources indicated that turtle catches were declining because of the reduced abundance. The Embassy also reported that Grenadian conservation efforts were helping to reduce catches.[401] Grenadian observers report, however, that in 2001 there was still directed fishing with some fishermen setting nets off beaches specifically for turtles. This practice is apparently declining, but still exists.[402] Turtles are now mostly taken on Grenada mostly incidentally to other fishing operations. Available catch data suggests little change in catch patterns which in most years range from 4-8 t (appendix C7). The 1999 catch totaled 5 tons. FAO reports the catch as green turtles.

The turtles are killed for meat as well as to make jewelry and tourist trinkets. The hawksbills are the only species with a shell suitable for jewelry, but other species can be used to make trinkets such as stuffed specimens. There is a small handicraft industry on the island which produces items for sale to tourists.

Bringing such items back to the United states and other CITES signatories is illegal. Not only is turtle meat popular in Grenada and used in a variety of local dishes when available, but the eggs are also gathered for food and sold in local markets. Turtle soup and eggs are considered a delicacy.[403] Leatherback eggs are particularly prized by Grenadians as a powerful aphrodisiac.[404]

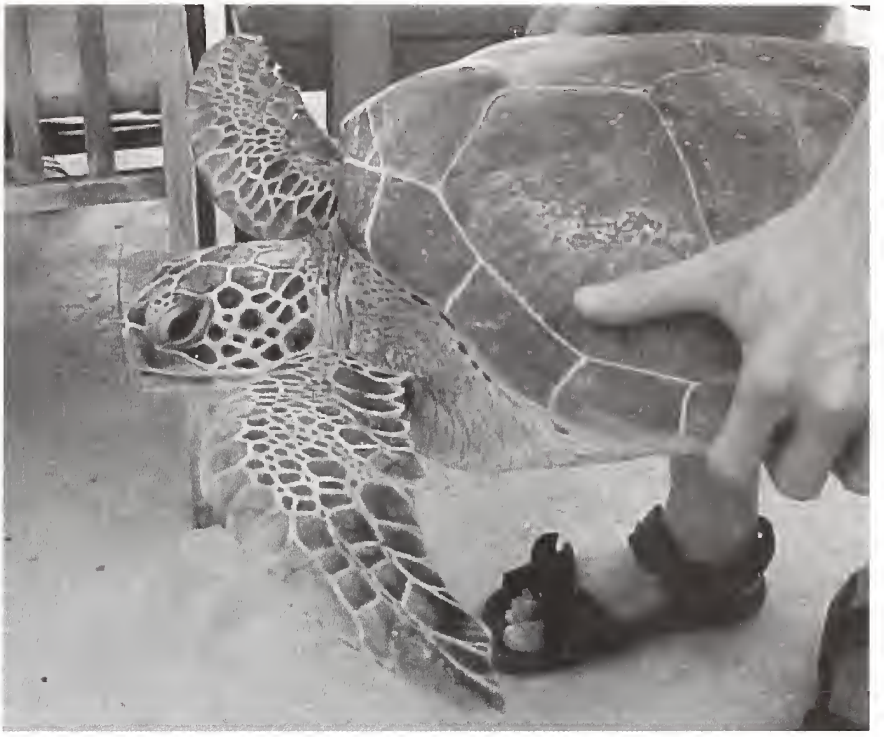


Photo 68.--Ocean Spirits has a program of purchasing turtles caught by artisanal fishermen, like this green turtle, so they can be released. Claire Shirley

The Grenadian Government permits fisherman to take turtles on a seasonal basis. Most of the turtles caught are green turtles which the local fishermen call chicken turtles. Smaller quantities of hawksbill, leatherbacks, and loggerheads are also taken. Fishermen set turtle nets along many Grenadian beaches, including popular tourist beaches like Grand Anse where green and hawksbill turtles can often be seen foraging. Apart from these nets, turtles are most commonly taken by spear fishing and opportunistically in other fisheries.[405]

The British authorities in 1957 moved to protect birds, turtles, and other wildlife. Turtles and turtle eggs were protected during a closed season.[406] The Grenadian Government in 1987 closed the fishery during the nesting season.[407] A closed season is currently enforced from May 1 to August 31. This is the same time that the spiny lobster fishery is closed. The taking of leatherbacks is prohibited, but other species can be caught during the open season if they are above the minimum size. The minimum size is 25 lb (11.3 kg) and egg poaching is not allowed, although the actual legal provision is unavailable.[408] Taking turtles during this period can result in fines up to EC$0.5 million (US$185,873) and prison terms of up to 2 years.[409] The enforcement of these regulations, however, is weak. One observer says that the regulations are simply not enforced, especially egg poaching. One assessment of Bathway and Levera revealed that egg poaching exceeded 70 percent of the eggs laid during March to July.[410] Officials would like to develop a co-management program in which the fishermen themselves act as enforcement agents, informing on their colleagues who illegally take turtles and poach eggs.[411]

Grenada's expanding tourist industry includes diving as one of the island's attractions. Diving is a very popular activity for tourists on Grenada. An internet search reveals a phenomenal number of internet sites offering diving opportunities on the island. Many of these dive operators and tourist promotions advertise that turtles can be viewed by divers.[412] Turtles are in fact a popular species among divers because they are found in relatively shallow water and can be easily observed by even novice divers. Tourists can also seasonally view turtle nesting on night outings.[413] These developments are of some importance, while tourist activity can cause problems in itself, it also creates an economic incentive to protect the turtles. Some Grenadians are in fact beginning to see turtles in the water as much more valuable as a tourist attraction than the value of turtle meat or eggs.[414] One group offers to buy unharmed turtles from fishermen to prevent them from being slaughtered. The turtles are then tagged and released.[415] The effort is part of the Turtle Project of Ocean Spirits, an incorporated charity, and the Planateers, a youth group at a community college. Ocean Spirits was formerly called "Saved from the Pot". Ocean Spirits, as part of their Turtle Project, have actually gone into St. George's Melville Street Fish Market, the most important public seafood market on Grenada, and purchased turtles that were about to be butchered.[416]

Little information is available on fishery interactions with turtles. The authors know of no study assessing turtle catches in the longline fishery. Turtles and turtle products appear in the local markets, however, they may be primarily from turtles taken by artisanal fishermen. Grenadian officials report that longline fishermen take few turtles.[417] Environmentalists report that there is simply no data available on longline interactions. The Ocean Spirits group reports that anecdotal information obtained from longline fishermen suggests that loggerheads are regularly taken. Some are reportedly released although this is also not documented. One report indicates that if the longline catch has been poor, then the fishermen are more likely to retain any turtles which may be hooked.[418]

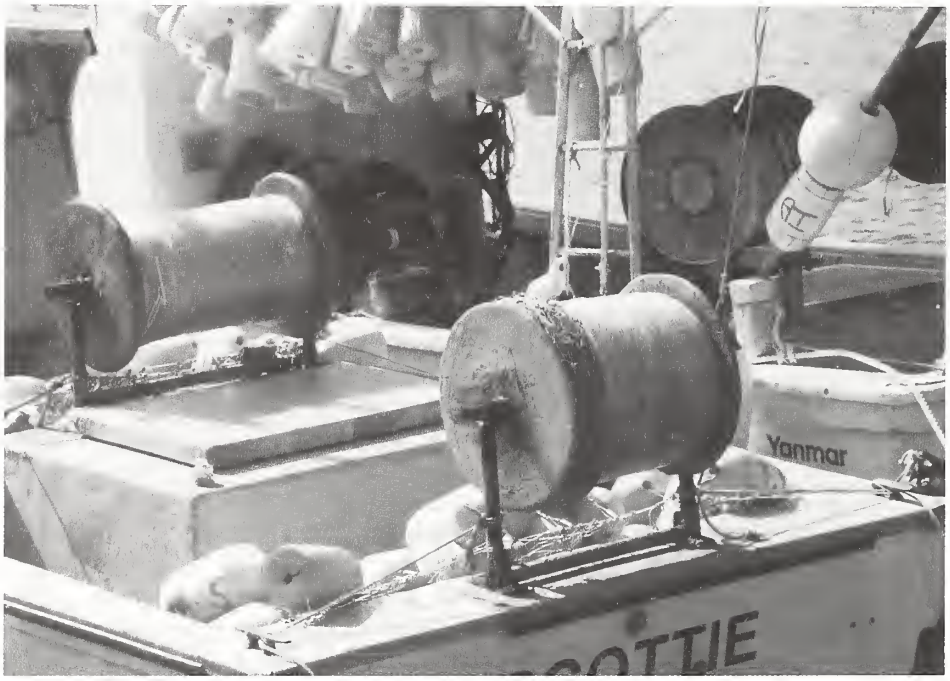


Photo 69.--Grenadian fishermen use American style-monofilament. Bycatch trends, however, may be different because of the fishermen's tendency to operate fairly close to shore. D. Weidner

Most Caribbean longline fisheries result in turtle bycatches, although the incidence is not well documented in the Caribbean. Both leatherbacks and loggerheads are known to be taken on longlines. Observers on U.S. longliners operating in the Caribbean confirm that these are the turtle species most affected by longlining (Caribbean Overview, appendix G5c). Leatherbacks in particular have been reported off Grenada. Unfortunately in the absence of data, the authors can only speculate about possible interactions. Of course the varying operations and grounds of the U.S. and Grenadian longline fishermen mean that incidental catches will also vary. Grenadian fishermen, however, in recent years have been adopting U.S. monofilament methods and target many of the same species. Actually a fleet which operates in more shallow water and closer to the coast may well experience a greater rate of turtle interactions than reported by the U.S. fishermen. In addition, it is likely that many Grenadian fishermen almost certainly retain their turtle bycatch rather than attempting to return them live as do many U.S. fishermen.

F. Marine mammals

Recreational fishermen report seeing a variety of marine mammals around Grenada. Species include dolphins and pilot, humpback, sperm, beaked, false killer, and Bryde's whales. Killer whales are not common.[419] Researchers have given some attention to humpbacks who migrate south to calving grounds off Grenada and other eastern Caribbean islands. Humpbacks off Grenada have been noted from the Greenland population.[420] The authors know of no Grenadian assessment of fishery interactions. Some of the charter boat operators offer whale and dolphin watching cruises.[421]

G. Seabirds

The authors have been able to find little information on seabirds off Grenada. The seabird population appears to be limited. Three species of seabirds are believed to breed on Grenada: Audubon's Shearwater (*Puffinus*), Laughing Gull (*Larus atricilla*), and Roseate Tern (*Sterna dougallii*).[422] The seabird population on the Granadines to the north is much more diverse. Available information suggest that as many as 12 seabirds may nest there (appendix G).

Recreational fishermen report citing a large variety of seabirds.[423] The authors know of no assessment of seabird interactions with Grenadian fishermen.

XVI. International

Grenada has conducted only minor fishery relations with other countries. The island is, however, ringed with neighboring countries (St. Vincent and the Grenadines, Barbados, Trinidad and Tobago, and Venezuela) that severely restrict its fishing zone. As long as the Grenadian fishing industry was largely artisanal fishing along the coast, extensive fishery relations were not a priority. As Grenada moves from an artisanal to a commercial fishery, with vessels ranging out beyond its EEZ, international fishery relations may take on greater importance. Grenada's principal efforts have been multilateral approaches with its OECS partners. The most significant bilateral relationships have been with Cuba, Japan, and the United States. Cuba played an important role during the early 1980s in promoting fisheries training and development efforts. The Japanese in the 1990s launched a major, well funded fishery development program that has financed the construction of important facilities as well as donated vessels. The U.S. relationship has been primarily a non-governmental role with U.S. fishermen helping acquaint Grenadian fishermen with improved gear and technology and providing the major market for seafood exports.

A. International relations

1. Multilateral organizations

The primary multilateral organization with which Grenada pursues international fishery relations is OECS.

CARICOM: CARICOM's principal fishery activities on Grenada have been in the area of research and related areas like data collection, primarily as part of the CFRAMP project. (See "XIV. Research".) The CFRAMP program is scheduled to expire in 2001. It is being replaced with a permanent regional fisheries organization the Caribbean Regional Fisheries Mechanism (CRFM). CRFM will be composed of the Ministerial Body, a Caribbean Fisheries Technical Unit and the Caribbean Fisheries Forum. CRFM is expected to continue CFRAMP's work. CRFM's mandate, however, is much broader and included such areas as management of shared resources and representing member countries at international fora.[424]

ICCAT: Grenada is not a member of the International Convention for the Conservation of Atlantic Tunas (ICCAT). Grenada has, however, been supportive of ICCAT research and data collection efforts. The DF has assisted ICCAT researchers collect onshore samples, although at sea work has proven more complicated. Grenada's small swordfish catch has meant that the country has had no real impact on ICCAT's swordfish management efforts. If the rising level of swordfish catches first noted in 1997 (appendix C3) are part of a long-term trend, then ICCAT may attempt to encourage Grenada to comply with non-member practices concerning ICCAT's management plans.

ICCAT in 1995 adopted a resolution concerning an Action Plan to ensure the Effectiveness of the Conservation Program for Atlantic Swordfish. The Action Plan (AP) set forth a process to seek the cooperation of non members with the ICCAT's Atlantic swordfish management plan. The AP encouraged interested parties to join ICCAT or at least voluntarily rectify fishing practices which diminish the effectiveness of ICCAT conservation measures. While ICCAT seeks voluntary compliance, as a

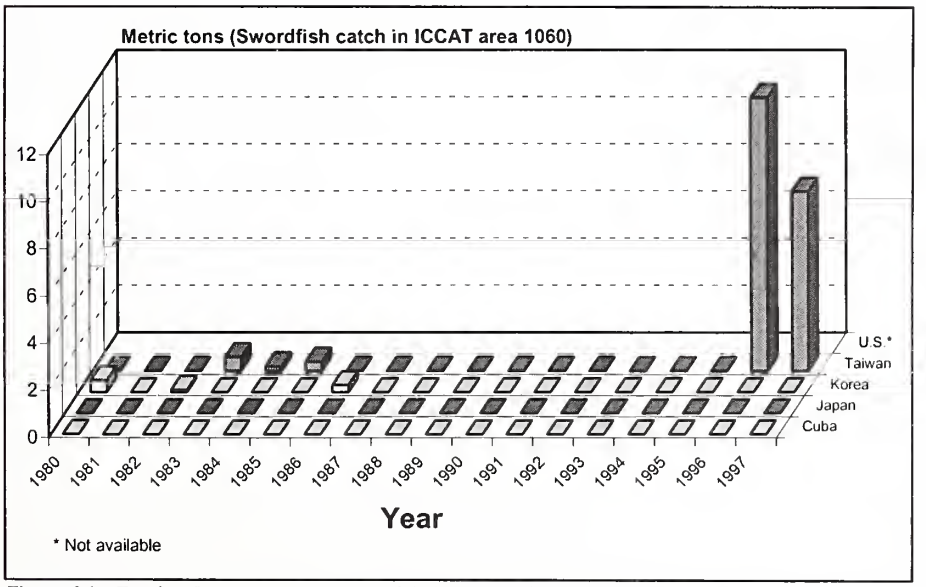


Figure 24.--Foreign fishermen have reported limited swordfish bycatches in the southern Lesser Antilles. Taiwan fishermen, however, have reported considerable activity in 1996-97.

last resort, non-discriminatory trade sanctions are possible. At its 2000 annual meeting, ICCAT noted that Grenada's vessels were taking swordfish and not reporting that catch. The ICCAT Commissioner in 2000 wrote to Grenada officials and urged them to join. ICCAT plans to review the information regarding Grenada at its 2001 annual meeting.[425]

OECS: Grenada is a member of the Organization for Eastern Caribbean States (OECS). Grenada has actively participated in the OECS Fisheries Unit.[426] The Unit is responsible for coordinating regional activities concerning fisheries and marine related activities. Grenada has adopted the OECS harmonized fisheries law and participates in the joint OECS fisheries enforcement effort such as common fishery zones for surveillance purposes. Grenada and its OECS partners have yet to determine the extent to which they want to create a common fishing zone.[427]

2. Bilateral relations

Grenada's bilateral fishery relations have primarily focused on Japan which has financed a major fisheries development program. Officials report that Grenada's expanding longline operations has resulted in vessel operators requesting that the Government obtain access to the waters of neighboring countries. Little has yet been accomplished in that regard. There is some possibility for cooperation and reciprocity among OECS-member countries.

Data on foreign fishing activity is not available specifically for Grenadian or other Caribbean island EEZs. ICCAT does, however, collect data reported by countries operating tuna longliners in the Atlantic and has computed that data by 5° squares (Caribbean Overview, series D appendices).

Grenada: Grenada and the islands of the southern Lesser Antilles, except Barbados, fall within ICCAT square 1060, the southeastern corner of the 5° square bounded by 10°-15°N and 60°-65°W. The foreign fishing activity noted below is based on the reported data in ICCAT square 1060 (appendix C9).

North: Foreign activity in the northern Lesser Antilles (ICCAT square 1560) is discussed in the Anguillian chapter of this report.

East: Foreign activity to the east of Grenada (ICCAT square 1055) is discussed in the Barbados chapter of this report.

South: There is little ocean area in the ICCAT square south of Grenada (ICCAT square 0560).

West: Foreign fishing west of Grenada is discussed in the Venezuelan chapter of this report.

The following information is available on fishery relations and fishing activities of foreign countries.

Cuba: Cuba has reported no fishing around the islands of the southern Lesser Antilles (ICCAT square 1060), even during 1979-83 (appendix C9). Cuba at that time developed close relations with the Bishop Government and helped found a fisheries training school. (See "Foreign aid" below.) Cuba frequently used the ties it developed with African countries to gain access to local waters. This does not appear to have been the case with Grenada. The authors note unusual Grenadian fishing activity in 1978-80. Very large tuna catches were reported by Grenada (appendix C3). This suggests foreign joint venture activity. It may not have been Cuban activity, however, as the time frame does not precisely match the Bishop era.

Japan: The Japanese first reported incidental swordfish catches in ICCAT square 1060 during 1958. Considerable fishing was reported during the 1960s and early 70s. In most years swordfish catches were minor. The Japanese, however, did report very large catches totaling nearly 23 t in 1966. The authors note no apparent seasonal pattern in the Japanese fishing. The last year that Japanese longliners reported activity in the southern Lesser Antilles was 1975 (appendix C9). Japanese sources confirm the cessation of fishing in the area. One Japanese report, for example, reported no billfish and other swordfish fishing off Grenada during 1993.[428] Despite the lack of fishing effort, Japan exhibited considerable interest in Grenada during the 1990s and has conducted an important fisheries assistance program. (See "Foreign aid" below.)

Korea: Korean fishermen report initiating longline operations in the southern Lesser Antilles (ICCAT area 1060) during 1966, the same year that Japanese fishermen reported such large swordfish bycatches. The Koreans then fished regularly until 1981. The last reported fishing was in 1985 (appendix C9). The Korean operations were highly seasonal. Fishermen through 1976 only operated in the second quarter of the year, subsequently operations were more varied, but generally in the third and fourth quarters.

Martinique: Grenada officials complained to Martinique officials about an incident between Martinique and Grenadian fishermen. The Grenadian fishermen (from Carriacou and Petite Martinique) apparently were attacked when they attempted to sell their catch in Martinique. The Martinique fishermen were upset because foreign landings (primarily Venezuelan) were adversely affecting their market prices.[429]

Spain: Spanish fishermen do not operate longliners in the Caribbean (appendix C9). Spanish operations are concentrated in the eastern north Atlantic and south Atlantic.[430] Spanish fishermen have moved somewhat further west during the 1990s, but there still is no longlining in the Caribbean.[431]

Taiwan: Taiwan, like the Japanese, initiated Caribbean-area longline operations during the 1960s. The primary Taiwan activity has been to the north of the Caribbean, as far as Bermuda, where they have targeted albacore to supply Puerto Rican canneries packing "white meat" tuna.[432] Many of the vessels have operated out of St. Maartens.[433] Available evidence suggests that Taiwan longliners are not extensively fishing Caribbean waters, but are using Caribbean ports to transship their catch and maintain their fleet. Taiwan vessels in the mid-1980s began expanding transshipping activities out of Port-of-Spain.[434] The vessels, however, do not appear to be the longliners targeting albacore to the north of the Caribbean. While the Taiwan fishermen do not appear to be very active in the Caribbean itself, they have been known to set opportunistically in waters adjacent to various Caribbean islands when in transit between their fishing grounds and Caribbean transshipment points. In the case of Grenada, this would primarily be the Taiwan longliners transhipping through Port-of-Spain. The Taiwan fishermen first reported longlining in the southern Lesser Antilles in 1968 and only reported scattered activity during the 1970s and 80s. Fishing ceased after 1985, but activity was reported in 1996 and 1997. Substantial swordfish landings of 11.6 t and 7.6 t were reported (appendix C9). There is no apparent seasonal pattern to the Taiwan fishing. Fishing in 1997 was reported in all four quarters. The data reported by Taiwan includes only Taiwan-flag vessels. This does not include the Taiwan-owned longliners flying St. Vincent and other foreign flags that operate out of Trinidad.[435]

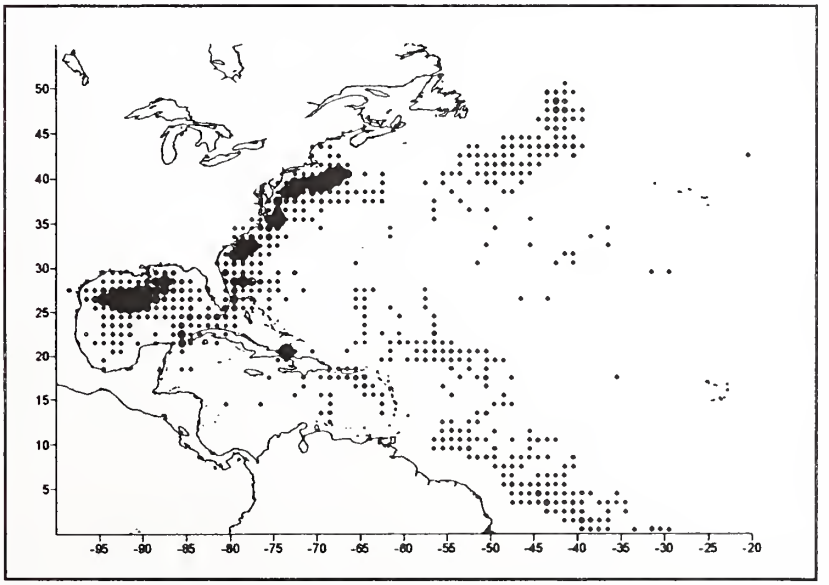


Figure 25.--U.S. longline fishermen in recent years have rarely fished off Grenada. Some effort, such as in 1997, occurs to the north, but more occurs outside the Caribbean arc. Cramer

United States: The United States began developing a longline fleet targeting yellowfin tuna in the Gulf of Mexico. U.S. longline fishermen began targeting swordfish in the mid-1980s after commercial stocks were encountered off the Florida Atlantic coast.[436] A small number of the swordfish/tuna U.S. longliners are active in the wider-Caribbean, including grounds to the north and east of Puerto Rico. The U.S. fishery is highly seasonal, primarily conducted during the winter months. U.S. effort in the southern Caribbean has been relatively limited (figure 25).[437] Some U.S. longliners have reportedly used Grenada as a port of convenience during the late 1980s.[438] Three U.S. longliners (*Mandy J*, *Sea Hawk*, and *White Seal*) were operating out of Grenada during 1986-88.[439] The vessels targeted tuna and swordfish on grounds in the southeastern Caribbean. Only the billfish bycatch, however, was unloaded in Grenada.[440] The Grenada seized the U.S. longliner *Miller Time II* in 1987. Three U.S.-owned longliners fished out of Grenada.[441] U.S. fishermen during the 1990s have stopped operating out of Grenada and landing fish there.[442]

B. Joint ventures

Several joint fishery ventures have been proposed for Grenada. Few were actually implemented. None appear to have been very successful. Several potential investors reported a variety of political complications in their efforts to work out the joint venture arrangements.

Canada: Halifax Seafoods and a Nova Scotia cooperative were considering a saltfish joint venture with Grenadian investors in 1987.[443] Salt cod is a staple in many Grenadian traditional dishes. The investors eventually concluded that curing operations on Grenada using imported cod were not economically viable.

United States: Grenadian and U.S. investors studied a variety of joint ventures, but the authors know of only one such venture which actually initiated operations.

Blue Ocean: A Grenadian official participated in the Blue Ocean Ltd. joint venture with Merrit Seafoods, a Florida-based U.S. fishing company in 1988. The official was sharply criticized by opposition parties for an official's apparent conflict of interest.[444] Blue Ocean landed some of its catch in Grenada and air shipped at least some of it to the United States, mostly swordfish.

They also landed some tuna.[445] Most of the catch was reportedly landed in Puerto Rico.[446]

Others: A U.S. company, Shore Lobster and Shrimp, in 1984 was considering an investment in the trap fishery.[447] The company's proposal, however, was not approved by the Grenadian Government which concluded that among other factors the arrangement would adversely affect artisanal fishermen. Another group, Pioneer Fishing, was offering an alternative export proposal. A Grenadian living in New York in 1988 was reportedly considering the purchase of two longliners to base in Grenada. He was going to hire U.S. masters to train them. A group of Cuban/American investors also expressed an interest during 1987 and 1988 in building a processing plant on Carriacou. Other interested investors including a Miami fish importer.[448]

C. Foreign aid

The principal multinational agency involved with Grenadian fisheries has been FAO. Much of the work has been conducted as regional projects.

CDB: The Caribbean Development Bank (CDB) participated in the World Bank-IFAD Artisanal Fisheries Development Project during the early 1980s.[449] The CDB was reportedly financing a port improvement project at St. George's during 1983.[450]

CFRAMP: The CARICOM CFRAMP project worked with the FD on both short-term and long-term training, institutional strengthening, and resource assessment and management.[451]

FAO: Grenada has received both direct and indirect fisheries assistance from FAO. FAO supported work on improved vessel type. A catamaran developed for Caribbean fisheries showed some promise.[452] Ultimately , however, the vessel proved too expensive for the local fishermen. FAO has provided assistance in helping the eastern Caribbean assess the importance of their EEZs and plan the utilization and management of available resources.[453] FAO helped organize a 1992 meeting of Caribbean countries to discuss issues involving EEZs.[454]

OECS: The Organization of Eastern Caribbean States has had very limited funds to help promote the fishing industries in member states. OECS efforts in harmonizing legislation and cooperation on enforcement, however, has proven beneficial.

World Bank: The World Bank International Fund for Agricultural Development (IFAD) in 1981 studied a comprehensive $2.7 million artisanal fisheries development project.[455] Grenada officials requested $4.5 million.[456] The project included the construction of processing and marketing facilities. Another important aspect of the project was a credit component to help fishermen buy improved gear and equipment.[457]

Several countries have played an important role in developing Grenada's longline fishery. Quite a range of countries have provided foreign assistance. The major fisheries programs were provided by the Cubans and Japanese, both of which included a longlining component. The United States has played an important non-governmental role.

Canada: The Canadian International Development Agency (CIDA) has supported a long-term fisheries development mission in Grenada which among other matters has assisted with fisheries management. Canadian officials have sponsored various training programs in the Caribbean, including Grenada.[458] One 1988 report indicated that the Canadians were planning to deliver five fishing vessels and trainers.[459]

Cuba: Cuban made a major effort to assist the PRG. Part of that effort included assistance to the Grenadian fishing industry. The Bishop coup establishing the PRG occurred March 13, 1979. A Cuban economic delegation arrived in Grenada on May 21, 1979.[460] Press reports indicated that a cooperation agreement had been reached with Cuba and that Cuban officials were in Grenada helping to prepare actual projects--including fishery projects.[461] Cuba helped set up the Grenada Fisheries School in 1979 and provided technicians to serve as instructors.[462] A scientific cooperation agreement was signed August 21, 1979.[463] As part of Cuba's foreign assistance program, Cuba provided several ferro-cement fishing boats. Accounts vary from 8-13 boats.[464] Most of the Cuban boats were trawlers, but included four small ferro-cement longliners.[465] The longliners were provided to the NFC/GCFL. There was another boat especially dedicated to training.[466] The Cubans reportedly caught substantial quantities of shark, which did not have much value on the Grenadian market.[467] Despite some training provided by Cuba, the vessels were never able to operate profitably. One source notes losses at the NFC/GCFL of $75,000, a sizeable sum in the Grenadian economy at that time.[468] By 1983 most of the vessels were sunk or abandoned.[469] The abandoned hulks can still be seen off Hog Island. The Cuban unfamiliarity in operating in a market economy requiring real profits may have been a factor in the difficulties encountered as well as problems with the vessels, including maintenance and fuel efficiency. Other sources say that the Grenadian fishermen had trouble "getting used" to the vessels.[470] The propensity to take shark, a species not desired by Grenadian consumers was another problem. Cuba's Grenadian fisheries assistance program was of some priority and Cuban Fisheries Minister Jorge Fernandez Cuervo visited the island in 1982.[471] One of the

reasons for the visit was to try to arrange for the salvaging of two Cuban vessels which sank. One report indicated that 16 Cuban fishermen worked in Grenada for 6-months, training the local fishermen in tuna operations.[472] Despite the difficulties encountered with their vessels, the Cubans did succeed in introducing pelagic longlining to Grenada. The training of local fishermen by the Cubans was in fact the beginning of the Grenada longline fishery, the first such local fishery in the Windward Islands.[473] The Cuban longlining did not employ reels and power winches, the fishermen deployed lines out of boxes. Each box had a segment of line and the fishermen could adjust the length of the line and number of hooks by varying the number of boxes deployed. The whole process was quite labor intensive. It was a technique, however, that could be transferred to the small pirogues that the artisanal fishermen deployed.[474] The training and experience obtained through working with the Cubans appears to explain, in part, why longlining has developed more on Grenada than several neighboring islands like St. Lucia and Dominica.

Photo 70.--The Japanese Government has financed an important fisheries development effort on Grenada, including the GCFL plant and pier at Grand Mal. D. Weidner.

Photo 71.--The Japanese Government aid program has included the donation of boats as well as training for the fishermen. Dennis Weidner

Japan: Japan has an active fisheries assistance program in the Caribbean and has provided bilateral assistance in such areas as fishing technology, technical assistance, the construction of piers and processing facilities, and the donation of boats. Japan conducts several fisheries assistance programs in the Caribbean. Their program on Grenada is one of the most active in the area. Japan in 1988 reportedly offered $13 million to finance a fisheries development project.[475] The Japanese funds were to be used to finance projects including processing plants, ice plants, cold stores, jetties, boats, and training.[476] Japanese officials reportedly assured Grenadian officials that they were not looking for fishing rights in exchange for the assistance offered. Some observers believe that the Japanese have reportedly used their assistance program to obtain support from island countries in various international fora. Conservationist groups like Green Peace charge that Japan was attempting to "buy" the votes of Caribbean island countries like Grenada.[477] The Japanese assistance has played an important role in the development of small-

scale commercial fishing on Grenada. One of the most important elements of the Japanese program was providing eight small 11-m fiberglass longliners to Grenada in 1991 through a cooperative project with the GCFL.[478] The Government delayed the deployment of the vessels for a year. While the vessels were donated by the Japanese, officials wanted to sell them to the fishermen who did not want to pay for what they saw as donated boats. Japan also sold large numbers of Yamaha outboard motors to artisanal fishermen at low prices. This was a boon to the artisanal fishermen, but reportedly put some local dealers out of business.[479] The Japanese also provided the funds to construct the GCFL processing plant and pier and Grand Mal which was opened in 1996.[480] The Japanese also financed the construction of the new fishing pier and fishing center by the Melville Street market in St. George's. Construction began in 1999 and some fishermen began using the pier in early 2001, although construction on all the associated facilities were not yet completed. A Japanese fishing technician in 2000 worked with the fishermen.[481] Resulting changes in fishing strategy has reportedly resulted in an increased swordfish catches and exports to the United States (appendix D2b).

Taiwan: Grenada is one of the few Caribbean countries which recognizes Taiwan rather than Mainland China as the Government of China. Taiwan and Grenada signed a cooperation agreement in July 1998. Under this agreement Taiwan conducts a significant foreign aid program with an important agricultural technical mission that has done some work in aquaculture. The authors know of no capture fishery projects.

USSR: The Soviets also attempted to assist the PRG during the early 1980s. The Soviet research institute AtlantNIRO assisted Grenada with resource assessment studies on the country's shelf during 1980-81.[482] One report indicated that Soviet research cruises during June-July 1980 found stocks of deepwater shrimp.[483] The survey was part of a joint study including areas off Nicaragua to assess both demersal and pelagic resources. Further Soviet resource assessments was conducted off Grenada, Jamaica, and Nicaragua.[484] One report indicates that the Soviets during the early 1980s also supplied instructors for the Grenada Fishing School, but other sources deny that Soviet teachers were involved at the fisheries training school. They may have been confused with Russian science teachers that were working in Grenadian schools.[485]

United States: The United States after the 1983 military intervention provided extensive assistance to Grenada which focused on improving the island infrastructure that had been allowed to deteriorate badly by the Bishop Government. In recent years the U.S. assistance has been scaled back significantly and never included a significant fisheries component. While the United States has not had a formal fisheries assistance program, informal contacts with U.S. fishermen has caused most Grenadian fishermen to change their operating systems to monofilament line set off large drums.

Venezuela: The Venezuelan Investment Fund in 1982 contributed to the $2.7 million IFAD loan to fund a fisheries development project.

Other: Prior to the 1983 U.S. military intervention, the Bishop Government received some fisheries assistance from communist countries. Cuba as described above was the principal country involved. Other communist countries (East Germany, North Korea, and the Soviets) provided more limited assistance. Libya also provided some assistance.

XVII. Enforcement

Grenada had a very limited enforcement capability until the PRG acquired 9-m Fairey Marine patrol boats in 1981. As a result, the Grenadians began to seize foreign fishing vessels operating in their EEZ. The British Navy is assisting the current Government to train Coast Guard personnel. Fishermen reported sightings of foreign distant-water fishermen. Fishery officials complain that the Grenadian Coast Guard has not been very active in enforcing the country's 200-mile EEZ.[486]

Available information on foreign fishing vessel activity and actual seizures include as well as other fishery incidents include:

Barbados: Fishery officials note that Barbados fishing boats sometimes fish off Grenada.[487]

Korea: Korean-owned vessels operating under the Panamanian flag were seized in 1981. Grenadian officials in 1996 reported occasionally sighting Korean longliners operating illegally off the western coast, as close as 50 km to Grenada.[488]

Martinique: Martinique is an important market for Grenadian fishermen. The fishermen on occasion, however, has been involved with incidents from Martinique's fishermen whom they compete with. Fishermen from Carriacou and Petit Martinique in 1987 complained of being attacked by gas bombs and their catch confiscated. Grenadian officials sent a protest note to French officials.[489]

Netherlands Antilles: The PRG in 1980 was trying to get the fishing vessel *Mananillo* returned from Curaçao in the Netherlands Antilles. The vessel was one of the donated Cuban ferro-cement vessels. It apparently broke its moorings, but was recovered by a U.S. vessel and towed to Curaçao. The PRG considered the salvage fee filed by the U.S. vessel as excessive.[490]

Panama: The PRG seized two Panamanian (South Korean flag-of-convenience) vessels (probably longliners) with a newly obtained 9-m Fairey Marine patrol boat in 1981. The vessels had Panamanian flags, but Korean crews. They were held for a few days and then permitted to leave. No information is available to the authors as to the legal disposition of the case.

St. Vincent: Fishery officials note that fishing boats from neighboring St. Vincent sometimes fish off Grenada.[491]

United States: Grenada seized the *Miller Time II* in January, 1987, and find it $56,000.[492] The owner subsequently attempted to purchase Grenadian licenses.[493] He operated from Grenada after the vessel was released, but reportedly fished at least 25 miles off shore. The Government seized the U.S. fishing vessel *Margarita* on February 14, 1990, as a result of legal questions concerning the ownership of the vessel.[494] Continuing legal questions resulted in government officials impounding the vessel again in October, 1990. This resulted in further protracted legal proceedings.[495] Presumably this litigation arose out of the Grenadian equity participation associated with qualifying for local licenses.[496] Grenadian officials on July 11, 1995, seized the U.S. longliner *Jannet Ann*, based in the U.S. Virgin Islands.[497] The vessel was owned by McAuliffe Fishing.

Venezuela: PRG patrol boats seized the Venezuelan tuna seiner *Linda Rose* on August 11, 1981. The captain claimed that he was returning from Atlantic fishing operations when a heavy rainstorm forced him

Photo 72.--Grenada's small longliners primarily operate relatively close to the coast. A few fishermen with larger boats have been asking the Government to help neighboring EEZs. D. Weidner

to seek shelter by moving into inshore waters while passing by Grenada. He complained that the PRG personnel aboard the patrol boat fired automatic weapons into the air. He was brought into St. George's harbor where he was accused of illegal fishing and his catch confiscated. Venezuelan diplomats intervened with PRG officials. The Venezuelans felt that Cuban diplomats were encouraging PRG officials to drag out the proceedings. The authors have no information on the eventual disposition of the case. The PRG seized a Venezuelan trawler on March 20, 1983. Grenadian authorities seized another Venezuelan vessel in 1986, but it was released without a fine to the displeasure of the enforcement personnel which seized the vessel. There have been several seizures by both countries in recent years, but the authors have few details. Venezuelan officials generally pursue legal actions against seized Grenadian fishing vessels, often including jail sentences and fines. Grenadian courts generally pardon seized Venezuelan fishermen, but confiscate their gear and catch.[498]

XVIII. Future Trends

Grenada is one of the eastern Caribbean islands with a substantial pelagic fishery. The Grenadian pelagic fishery began as an artisanal fishery, but has developed into a small-scale commercial fishery. Quite a number of longliners are involved. The artisanal fishermen deploy longlines, but the small-scale commercial fleet totals about 40 longliners which target tuna and billfish, usually fairly close to the island. The swordfish catch is very limited, but growing. Substantial quantities of billfish are taken. One local company in the mid-1990s had stopped exporting swordfish to the United States, because shipments were detained, causing substantial losses. Other companies continued to export small quantities of swordfish and larger quantities of tuna. A Japanese adviser has been working with the fishermen and changes in fishing strategies has been noted in recent years.

Grenada's longline fishery is profitable. Some changes in fishing strategy have allowed the fishermen to increase swordfish catches and shipments since 1997. Trends in the tuna fishery are less clear. There are significant annual fluctuations being reported. The fishermen, for instance, report a substantial increase in 1999. Grenadian fishermen at this time show no signs of expanding their operations. The fishermen still use very basic gear and methods. There is no indication at this time that Grenadian fishermen are interested in making or capable of financing substantial investments in larger longliners or purchase sophisticated electronic instruments or gear capable of setting longer lines. It is likely that for the foreseeable future Grenada's longline fishery will continue at current levels, perhaps, gradually expanding catch. The increased swordfish catches and shipment since 1997, however, shows that the fishermen are amenable to technical innovation. A considerable number of Grenadian fishermen have basic skills in longlining and investments in improved vessels and gear could result in substantial further catch increases.

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210. Finlay, *op. cit.*, January 18, 1996.
211. Finlay, "A changing status ...," *op. cit.*, p. 39.
212. Miller, *op. cit.*, September 26, 1999.
213. Phillip and Issac, "Sampling activities ...," *op. cit.*, p. 675.
214. Andrews, "Analysis of billfish fisheries ...," *op. cit.*, p. 407.
215. Rennie, *op. cit.*, September 27, 1999.

216. Vincent, *op. cit.*, September 28, 2001.
217. Miller, *op. cit.*, September 26, 1999.
218. "Port complex," CANA, Bridgetown radio broadcast," 2147 GMT, June 11, 1981.
219. "Government opens big seaport improvement project," CANA, Bridgetown radio broadcast, 2300 GMT, April 20, 1983.
220. Phillip and Issac, "Sampling activities ...," *op. cit.*, p. 675.
221. FAO, "Fishing industry profile *op. cit.*, p.3.

SECTION IX. (Transshipments)

222. Juhl, *op. cit.*, March 25, 1988.
223. Phillips, *op. cit.*, August 3, 1999.
224. Trinidad until recently did not have an effective vessel licensing program. As a result, some commercial fishermen licensed their vessels on neighboring countries. This was especially true of the longliners, which unlike many other Trinidadian fishermen, did not restrict their operations to coastal waters. See the Trinidadian chapter of this report for greater detail.
225. J. Fletcher, *op. cit.*, February 19, 2001.
226. Vincent, *op. cit.*, February 19, 2001.

SECTION X. (Processing and Products)

227. Phillips, *op. cit.*, August 3, 1999.
228. Eric Prince, NMFS, personal communications, February 26, 1996.
229. *New Clarion*, July 29, 1987.
230. Vivian Philbert, "Groundwork done for thriving fishing industry," *Free West Indian*, January 1, 1981, p. 17.

SECTION XI. (Companies and Cooperatives)

231. S. Fletcher, *op. cit.*, September 28, 1999.
232. B. Fletcher, *op. cit.*, February 19, 2001.
233. J. Fletcher, *op. cit.*, February 19, 2001.
234. B. Fletcher, Caribbean Seafood, personal communications, September 28, 1999.
235. S. Fletcher, *op. cit.*, September 28, 1999.
236. Rennie, *op. cit.*, September 27, 1999.
237. Phillips, *op. cit.*, August 3, 1999.
238. Megil Vincent, Project Manager, Grenada Commercial Fisheries Ltd., personal communications, September 27, 1999.
239. Rennie, *op. cit.*, September 27, 1999.
240. Vincent, *op. cit.*, February 19, 2001.
241. Vincent, *op. cit.*, September 27, 1999 and April 4, 2001.
242. State fishing companies were established in 14 different Latin American countries. In most cases they were financial disasters. Dennis Weidner, "Latin American state fishing companies," *International Fishery Reports* (IFR-85-10), February 11, 1985.
243. "Cuba gives four fishing boats, other assistance," *Advocate News*, March 5, 1982, p. 3. The basic vessel type could be used in several fisheries, depending on how it was rigged. Cuban fishermen outfitted some of the boats for "bonito" fishing, the Cuban term for skipjack, using live-bait techniques. Off Grenada, these boats appeared to have been rigged for longlining.
244. "Four additional trawlers received from Cuba," St. George's radio broadcast, 2300 GMT, March 17, 1981; U.S. Embassy, Bridgetown, "World Bank report ignores harsh reality of Grenada's economic situation," message number 744, February 9, 1993; and Edward Cody, "Grenada, no longer little noted, 'revels' in tweaking the U.S. cheek," *Washington Post*, April 21, 1983.
245. In fact, Cuban state companies do not appear to have had any realistic data on their own production costs. For details see the Cuban chapter of this report.
246. Philbert, "Fishing industry ...," *op. cit.*, p. 17.
247. J. Finlay, "Main developments in Grenada fisheries (1979-82) and summary of national statistics", journal unavailable, p. 11-17.

248. Finlay, "A changing status ...," *op. cit.*, p. 41.
249. U.S. Embassy, Grenada, "Report on the Committee Reviewing the Viability of State Enterprises in Grenada: The Singh Report," message number 2885, August 10, 1984.
250. Rennie, *op. cit.*, September 27, 1999.
251. Ince, *op. cit.*, September 28, 1999.
252. Brown, *op. cit.*, February 5, 2001.
253. Ince, *op. cit.*, September 28, 1999.
254. IFAD, "Report and recommendation ...," *op. cit.*, p. 11.
255. "Three fishermen groups formed in Grenada," *Network News*, No. 5, September 9, 1986, p. 4.
256. IFAD, "Report and recommendation ...," *op. cit.*, p. 15.
257. As the Grenadian fishermen have increasingly landed their catch for sale at these markets, FD monitoring and data collection has focused on the markets as a source of data on daily landings. Jeffrey, "trends in ...," *op. cit.*, p. 14.
258. FAO, "Grenada," *FAO Country Profiles* (FAO: Rome, 1987), p. 2. [4p]
259. Jeffrey, "Trends ...," *op. cit.*, p. 14.
260. Mitchell and Gold, "The integration of marine space ...," *op. cit.*, p. 136.
261. The flow diagram of fishery resources (figure 15) from my thesis is a conceptual model of the flow of fishery resources developed based on interviews with fishery officers (Justin Rennie and Paul Phillips) fish market managers, and one exporter. The model is in no way complete and refers only to near shore fishes (coastal pelagics and demersals) landed at the government markets. It is quite possible that some local fishermen may deal directly with exporters. I also suspect that trade in pelagic fishes (most of which go to the export market) may be slightly different from trade in demersal and purse (beach) seine fishes that supply the local market. Fish vendors (middle men and women) played an important role in demersal and beach seine fisheries by providing a wider local market for the sale of fish. They would purchase fish from the fishers and then take the fishes in cars, or baskets on their heads to interior villages for sale. This arrangement was very common in the 1980s and early '90s, the years covered by my thesis. It is very possible that such an arrangement is on the decline, given the greater focus by fishers on pelagic fishes for the export market. Jeffrey, *op. cit.*, February 27, 2001.
262. S. Fletcher, *op. cit.*, September 28, 1999; Vincent, *op. cit.,* September 27, 1999; and Ince, *op. cit.*, September 28, 1999.
263. Jeffrey, *op. cit.*, June 4, 1999.
264. Mitchell and Gold, "The integration of marine space ...," *op. cit.*, p. 129.
265. Jeffrey, *op. cit.*, February 27, 2001.
266. U.S. Embassy, Grenada, "Grenada fishermen encounter problem with Martinique market," message number 182, April 13, 1987.
267. Raymond Renaud, Melville Street Fish Market Supervisor, interviewed in Jeffrey, *op. cit.*, p. 14.
268. Mitchell and Gold, "The integration of marine space ...," *op. cit.*, pp. 136-137.
269. Giudicelli, "Grenadian fisheries ...," *op. cit.*, p. 7.
270. Finlay, "A changing status ...," *op. cit.*, p. 39.
271. Finlay, "A changing status ...," *op. cit.*, p. 39.
272. Finlay, "A changing status ...," *op. cit.*, p. 39.
273. Juhl, *op. cit.*, March 25, 1988.
274. Jeffrey, *op. cit.*, June 4, 1999.
275. Vincent, *op. cit.*, February 19, 2001.
276. Vincent, *op. cit.*, February 19, 2001.
277. Prince, *op. cit.*, February 26, 1996.
278. Jeffrey, "Trends ...," *op. cit.*, p. 15.
279. CARICOM, "Fishing industry profile ...," *op. cit.*
280. U.S. Embassy, Grenada, "Grenada fishermen encounter problems with Martinique market," message number 182, April 13, 1987.
281. Finlay, *op. cit.*, January 18, 1996.
282. Juhl, *op. cit.*, March 25, 1988.
283. Brown, *op. cit.*, February 5, 2001.
284. Vincent, *op. cit.*, September 28, 2001.
285. CARICOM, "Fishing industry profile ...," *op. cit.*
286. U.S. Federal Regulations. Title 50, Part 644, section 34, April 2, 1991.
287. J. Fletcher, *op. cit.*, September 28, 1999.

288. Vincent, *op. cit.*, September 28, 1999.
289. Phillips, *op. cit.,* August 3, 1999.
290. J. Fletcher, *op. cit.*, September 28, 1999.

SECTION XIII. (Government Policy)

291. FAO, "Grenada," *op. cit.*, p. 3.
292. The Grenada Fisheries Act No. 15, 1986 and the Grenada Fisheries Regulations SRO No. 9, 1987.
293. Finlay, "Policy perspectives ...," *op. cit.*, p. 101.
294. Finlay, *op. cit,*, January 18, 1996.
295. Territorial Waters Act No. 17, November 1, 1978.
296. Marine Boundaries Act No. 20, November 1, 1978.
297. The Grenada Territorial Waters and Marine Boundaries Act of 1970.
298. Jeffrey, "Trends ...," *op. cit.*, p. 13.
299. Phillips, *op. cit.*, August 3, 1999.
300. Jeffrey, "Trends ...," *op. cit.*, p. 13.
301. Otway, *op. cit.*, September 26, 1999.
302. Fisheries Act of 1986, Section 8. The Act defines locally based as vessels landing their catch in Grenada. Foreign fishermen would, however, be unwilling to market their catch in Grenada as high prices for tuna and swordfish are available in U.S. and other export markets. U.S. Embassy, Grenada, "Grenada fishing permit," message number 388, February 18, 1987.
303. U.S. Embassy, Grenada, "Grenada fishing update," message number 2065, August 31, 1988.
304. U.S. Embassy, Grenada, "Possible corruption involving Grenada foreign fishing permits," message number 3133, December 30, 1988.
305. Andrews, "Analysis of billfish fisheries ...," *op. cit.*, p. 408.
306. See "XVII. Enforcement".
307. U.S. Embassy, Grenada, "Grenada fishing update," message number 2065, August 31, 1988.
308. U.S. Embassy, Grenada, "GOG unhappy with recently licensed U.S. fishermen," message number 1250, May 26, 1988.
309. The catch would presumably be lower during the summer months. U.S. Embassy, Grenada, "GOG unhappy with recently licensed U.S. fishermen," message number 1250, May 26, 1988.
310. The royalties were calculated at $0.30 per pound. U.S. Embassy, Grenada, "GOG unhappy with recently licensed U.S. fishermen," message number 1250, May 26, 1988.
311. U.S. Embassy, Grenada, "Grenada fishing update," message number 2065, August 31, 1988.
312. U.S. Embassy, Grenada, "Possible corruption involving Grenada foreign fishing permits," message number 3133, December 30, 1988.
313. U.S. Embassy, Grenada, "Possible corruption involving Grenada foreign fishing permits," message number 3133, December 30, 1988.
314. Finlay, *op. cit.*, January 18, 1996.
315. Finlay, "Policy perspectives ...," *op. cit.*, p. 102.
316. Rennie, *op. cit.*, September 27, 1999.
317. Finlay, "Policy perspectives ...," *op. cit.*, p. 102.
318. IFAD, "Report and recommendations ...," *op. cit.*, pp. v and 5.
319. Finlay, "A changing status ...," *op. cit.*, pp. 37-38.
320. Finlay, "A changing status ...," *op. cit.*, pp. 41-42.
321. Giudicelli, "Grenadian fisheries ...," *op. cit.*, p. 7 and Finlay, "Main developments ...," *op. cit.*, pp. 11-12.
322. CARICOM, "Fishing industry profile ...," *op. cit.*
323. Ince, *op. cit.*, September 28, 1999.
324. Steele, *op. cit.*, August 9, 1995.
325. Rennie, *op. cit.*, September 27, 1999.
326. Juhl, *op. cit.*, March 25, 1988.
327. Longlining is not an energy intensive fishing method, but it does require much more fuel than what the fishermen were using in small boat, inshore operations.
328. Phillips, *op. cit.,* August 3, 1999.
329. Turner, "Rough sailing ...," *op. cit.*, p. 37A.

330. Caribbean Environmental Programme (CEP), "Status of protected area systems in the wider-Caribbean region: country profiles--Grenada," *Technical Report*, No. 36, 1996.
331. An insightful look at Levera National Park is available in K. Beusen, "National parks and local involvement in Grenada: An object lesson from the Caribbean," *Courier*, no. 148, 1994, pp. 89-90.
332. Otway, *op. cit.*, September 27, 1999.
333. Jeffrey, *op. cit.*, February 27, 2001.
334. Jeffrey, *op. cit.*, February 27, 2001.

SECTION XIV. (Research)

335. Finlay, "Main developments ...," *op. cit.*, p. 13.
336. J. Finlay and J. Rennie, "Length frequency of selected species oceanic pelagics from the catches of Grenada," in Western Atlantic Fisheries Commission, National reports and selected papers presented at the Fifth Session of the Working Party on Assessment of Marine Fishery Resources, November 3-7, 1986, St. George, Bermuda, *FAO Fisheries Report* , No. 376 (suppl.), 1988, pp. 73-78.
337. ICCAT, "Program plan for the ICCAT Enhanced Research Program for Billfish - 1991," *ICCAT Report*, 1988-89, Part I, (ICCAT: Madrid, Spain, 1991), p. 394.
338. ICCAT, "Program plan for the ICCAT enhanced research program for billfish - 1992," *ICCAT Report*, Part II, 1990-91 (ICCAT: Madrid, Spain, 1992), p. 243.
339. ICCAT, "Quarterly highlight report of the ICCAT Enhanced Research Program for Billfish," July-September, 1993, p. 3.
340. CARICOM/CFRAMP-PRFRAU, "Report ...," *op. cit.*, p. 263.
341. The fishery for tuna and sailfish tends to wind down during the hot summer months. ICCAT, "Biannual highlights report: ICCAT Enhanced Research Report for Billfish, 1/01/96 to 7/30/96," p. 2.
342. The researcher involved was Paul Phillip. ICCAT, "Quarterly highlights report," ICCAT Enhanced Research Program for Billfish, January-March, 1991.
343. Claire Shirley, Ocean Spirits, March 6, 2001. Poaching of leatherback eggs in 2000 was reported at 68 percent. Poaching rates in some moths exceeded 90 percent. Lloyd and King, "Population and regional orientation ...," *op. cit.*, p. 14.
344. Karen Eckert, WIDECAST, personal communications, February 14, 2001 and Claire Shirley, Ocean Spirits, March 6, 2001.
345. The CFRAMP Pelagic/Reef Fishing Unit was initially run from St. Vincent. The program has since been curtailed and the remaining staff person moved to Trinidad in 1999.
346. FAO, "Grenada," *op. cit.*, p. 3.
347. CARICOM/CFRAMP, "Statement by the CARICOM (Caribbean Community) Fisheries Resource Assessment and Management Program (CFRAMP)," ICCAT Doc. No. 018, November 13, 1995.
348. Mahon, Singh-Renton, Jennings-Clark, Rennie, Ryan, and Willoughby, "Yellowfin tuna catch ...," *op. cit.*
349. C. Gomes, R. Mahon, S. Singh-Renton, and W. Hunte, "The role of drifting objects in pelagic fisheries in the southeastern Caribbean," *CARICOM Fisheries Research Document*, No. 15 (CARICOM, Belize City, 1994), 36p.
350. CARICOM, "Report of the CARICOM ...," (SCRS/98/102), *op. cit.*
351. Suzanne Sing-Renton, CFRAMP, personal communications, September 20, 1999.
352. CARICOM, "CARICOM Regional Fisheries Mechanism," internet site accessed February 23, 2001: http://www.caricpm-fisheries.cm.crfm
353. See for example P.A. Mazeika, T.H. Kinnder, and D.A. Burns, "Measurements of subtidal flow in the Lesser Antilles passages," *Contribuciones Estación de Investigaciones Margarita*, No, 107, 1983, 6p.
354. See the Venezuelan chapter of this report for details.
355. Eric D. Prince, "Progress of the ICCAT enhanced research program for billfish in the Western Atlantic Ocean during 1994," *ICCAT Collective Volume of Scientific Papers* (ICCAT: Madrid, Spain, 1995), p. 7. [6-8]
356. "Program of the Enhanced Research Program for Billfish during 1988," *ICCAT Report*, 1988-89, Part I, (ICCAT: Madrid, Spain, 1989), p. 231.
357. ICCAT, "Quarterly highlights report," ICCAT Enhanced Research Program for Billfish, January-March, 1991. A good review of the ERPB sampling program in the western Caribbean is available in Robin L. Carter, "A summary of shore-based and at-sea sampling in the western Atlantic Ocean 1987-1992: ICCAT Enhanced Research Program for Billfish," SCRS/92/59.
358. Phillip and Issac, "Sampling activities ...," *op. cit.*, p. 674.

359. Paul E. Phillip, "Analysis of the ICCAT enhanced research shore-based program in Grenada from 1988 to 1992," *ICCAT Collective Volume of Scientific Papers* (SCRS/92/67), Vol. 41, 1994, pp. 425-430; E.D. Prince, "Progress of the ICCAT Enhanced Research Program for billfish in the western Atlantic Ocean during 1994," *ICCAT Collective Volume of Scientific Papers* (SCRS/94/147), Vol. 44, no. 3, 1995, pp. 6-8; and E. Prince, "Progress of the ICCAT enhanced research program for billfish in the western Atlantic during 1995," *ICCAT Collective Volume of Scientific Papers* (SCRS 95/107), 1995, Vol. 45, no. 2, pp. 308-310.
360. ICCAT, "Quarterly highlights report," ICCAT Enhanced Research Program for Billfish, July 1-September 30, 1993, p. 2 and ICCAT, "Quarterly highlight report," ICCAT Enhanced Research Program for Billfish," October-December, 1993, p. 2.
361. Prince, "Progress of the ICCAT Enhanced Research Program for Billfish in the western Atlantic Ocean during 1994," *op. cit.*, pp. 6-8 and Prince, "Progress of the ICCAT Enhanced Research Program for Billfish in the western Atlantic Ocean during 1995," *op. cit.*, pp. 308-310.
362. Prince, "Progress ..., 1995," *op. cit.*
363. CARICOM, "Report of the CARICOM ...," (SCRS/98/102), *op. cit.*
364. Wilson and Johns, "Velocity structure ..., " *op. cit.*, pp. 487-520.
365. Mark Farber, NMFS, personal communications, May 8, 2000.
366. See for example Febres Ortega and Herrea, "Circulación y transporte ...," *op. cit.*, pp. 21-23.
367. For details see the Venezuelan chapter of this report.

SECTION XV. (Bycatch)

368. ICCAT, "Report of the meeting of the standing committee on research and statistics," *ICCAT Report* Part II, 1992-93 (ICCAT: Madrid, Spain, 1994), p. 208.
369. Phillip and Issac, "Sampling activities f...," *op. cit.*, pp. 674-682.
370. Asian longline countries and Spain have not reported in detail on the species composition of their substantial Atlantic longline operations. One exception is the reporting required of the Japanese when operating in U.S. and Canadian waters. NMFS personnel working on sharks, however, have noted a few preliminary papers in recent years with some shark species data. There may be data on other bycatch species as well. John Hoey, NMFS, personal communications, August 3, 2001. An example of one of these papers is Valentín Buencuerpo, Santiago Ríos, and Julio Morón, Pelagic sharks associated with the swordfish, *Xiphias gladius,* fishery in the North Atlantic Ocean and the Strait of Gibraltar," *Fisheries Bulletin*, 1998, Vol. 96, pp. 667-685.
371. Juhl, *op. cit.*, March 25, 1988.
372. Officials reported that one U.S. longliner returned to port with 5.4 t of swordfish and tuna and only 0.1 t of bycatch. Grenadian trainees also reported seeing marlin and other bycatch discarded to make room for swordfish and tuna. U.S. Embassy, Grenada, "GOG unhappy with recently licensed U.S. fishermen," message number 1250, May 26, 1988.
373. U.S. Caribbean bycatch data is summarized in the Puerto Rican chapter of this report.
374. For details see the Venezuelan chapter of this report.
375. J. Marcille, "Tuna Resources of the Lesser Antilles. Present State of Fisheries and Prospects for Development," *FAO Fisheries Circular* No. 787, (Rome: FAO, 1985), 33p.
376. Phillip and Issac, "Sampling activities ...," *op. cit.*, p. 675.
377. Rennie, *op. cit.*, September 27, 1999.
378. Rennie, *op. cit.*, September 27, 1999.
379. B. Fletcher, *op. cit.*, September 28, 1999.
380. The record Grenadian yellowfin catch was 709 t in 1980 (appendix C3). The authors, however know nothing about that catch. It seems excessively large for the Grenadian fleet and the authors believe that foreign vessels may have been involved.Another unusually large catch of 506 t was reported in 1986. Again the authors have no information explaining such a large catch and foreign vessels may have been involved.
381. Mahon, Singh-Renton, Jennings-Clark, Rennie, Ryan, and Willoughby, "Yellowfin tuna catch ...," *op. cit.*
382. S. Fletcher, *op. cit.*, September 28, 1999.
383. Grenadian blackfin catches are variable, but can exceed 200 t (appendix C3). A substantial part of this catch, however, is taken by artisanal trolling.
384. Phillips, *op. cit.*, August 3, 1999.
385. Unidentified tunas often represent a sizeable part of Grenadian tuna shipments to the United States (appendix D3). The authors believe that much of the unidentified tuna is actually yellowfin.
386. Rolf Juhl, NMFS memo, March 25, 1988.

387. ICCAT, "Quarterly highlights report," *op. cit.*, January-March, 1991.
388. Mahon, Rennie, Ryan, and Sing-Renton, "Billfish catch ...," *op. cit.*, p. 434.
389. ICCAT Secretariat, "Summary of shark by-catch statistics received," *ICCAT Collective Volume of Scientific Papers* (SCRS/96/7), Vol. 46, No. 4 (ICCAT: Madrid, 1997), p. 374.
390. It could be that the day longliners are catching sharks, but not retaining the carcasses.
391. Ince, *op. cit.*, September 27, 1999.
392. ICCAT Secretariat, "Summary of shark by-catch ...," *op. cit.*, p. 374.
393. Finlay, *op. cit.*, January 18, 1996.
394. Ince, *op. cit.*, September 28, 1999 and Rennie, *op. cit.*, September 27, 1999.
395. Finlay, *op. cit.*, January 18, 1996; Juhl, *op. cit.*, March 25, 1988; and Harford, *op. cit.*, September 26, 1999.
396. Rennie, *op. cit.*, September 27, 1999.
397. Claire Shirley, Ocean Spirits, e-mail message, October 11, 2000.
398. Grenada Board of Tourism, "Eco-Adventure in Grenada," cached internet site accessed February 14, 2001: http://www.grenada.org/gdeco01.htm
399. Anne Meylan and Peter Meylan, "'Bermudiana,' a case for international protection of sea turtles," *Velador*, 1999. For more details see the Bermuda chapter of this report.
400. Carl Lloyd and Rebecca King, "Population and regional orientation of Grenada's endangered sea turtle stocks: A study to investigate the current status of nesting leatherback populations," undated report, probably 2001 prepared for Ocean Spirits.
401. U.S. Embassy, Grenada, "International conservation and protection of sea turtles: Commercial fishing operations in Grenada," message number 159, January 30, 1990.
402. Shirley, *op. cit.*, March 6, 2001.
403. "Eating the Grenadian way," internet site accessed February 14, 2001: http://cwr.utoronto.ca/cultural/english/grenada/eating.html
404. Phillips, *op.cit.*, August 3, 1999.
405. Claire Shirley, Ocean Spirits, personal communication, February 20, 2001.
406. Cap. 36. The Birds and Other Wildlife (Protection Of) Ordinance of 1957.
407. One Grenadian source notes Act 64, 1987. Another source reports the closed season is based on the Grenada Fisheries Act No. 15 of 1986 and implemented by SRO No. 19, 1987 (Section 17 Turtles.).
408. DF officials provided the minimum size. Rennie, *op. cit.*, September 27, 1999. A group working with the turtles has also reported that Government officials indicated that there was a 25 lb minimum size as well as other provisions making it illegal to possess leatherbacks or take any turtle eggs at any time or take nesting turtles. Shirley, *op. cit.*, March 6, 2001. The authority for these regulations is Fisheries (Amendment) Regulations 2001, SRO2, p. A6, new regulation 17 inserted. We were, however, unable to obtain the official notice published by the Ministry on the seasonal closure and minimal sizes.
409. The Grenada Fisheries Act of 1986.
410. Shirley, *op. cit.*, March 5, 2001.
411. Rennie, *op. cit.*, September 27, 1999.
412. Grenada Board of Tourism, "Eco-Adventure in Grenada," *op. cit.*; Grenada Explorer, "Diving in Grenada," internet site accessed February 14, 2001: http://grenadaexplorer.com/Diving.htm; and Regal Diving, "Grenada," internet site accessed February 14, 2001: http://www.regal-diving.co.uk/docs/hols/grenada.htm. A simple internet search for Grenada turtles will bring up quite a large number of similar sites.
413. Grenada Board of Tourism, "Grenada's Dive Festival '99," internet site accessed February 14, 2001: http://www.grenada.org/divefestival.htm
414. The authors know of no economic assessment on Grenada. But some work has been done in other countries on the relative value of turtles, comparing the economic value of turtles harvested for meat as to their value in the water as a tourist attraction. Studies show that the value as a tourist attraction is several orders of magnitude greater. Jack Fraser, personal communications, February 14, 2001. A particularly insightful study was prepared in Costa Rica addressing this issue. Carmen Castro Morales, Sebastian Tröng, Lucrecia Monterrosa, Donald Campbell, and Eduardo Chamorro, "Valoración del daño ecológico causado al medio ambiente referente a la caza de tortuga verde (*Chelonia mydas*)", Dictamen pericial, (Caribbean Conservation Corporation: 2001), 14p. The difficulty is, however, that different groups of people benefit. Thus while the overall economy may benefit for protecting turtles, the often poor artisanal fishermen who take turtles do not.
415. Such programs always run the risk of encouraging the fishermen to catch turtles, but turtles in Grenada are now more of an incidental than a directed fishery. The group first worked with a dive operator, Ecodive. They have since formed Ocean Spirits, a NGO pursuing a variety of projects related to protecting turtles, including

working with local schools to promote turtle conservation. They hope to eventually employ local fishermen in the turtle conservation effort. Ecodive, "Grand Anse Aquatics home page," internet site accessed February 14, 2001: http://www.geocities.com/The Tropics/Shores/5392/ and Shirley, *op. cit.*, March 6, 2001.
416. Turtle Island Earth Stewards (TIES), "Grenada project," internet site accessed February 14, 2001: http://www.ties.bc.ca/grenProj.htm
417. Rennie, *op. cit.*, September 27, 1999.
418. Shirley, *op. cit.*, February 20, 2001.
419. Harford, *op. cit.*, September 26, 1999.
420. P.T. Stevick, C.A. Carlson, and K.C. Balcomb, "A note on the migratory destinations of humpback whales from the eastern Caribbean," *Journal of Cetacean Research and Management* Vol. 1, No. 3, December, 1999, pp. 251-254.
421. Otway, *op. cit*, September 26, 1999 and Grenada Board of Tourism, "Grenada's Dive Festival '99," *op. cit.*
422. Halewyn and Norton, 1974.
423. Otway, "Grenada: A sportfishing destination," *op. cit*, p. 29.
424. Detailed information on CRFM is available at CARICOM, "CARICOM Regional Fisheries Mechanism," *op. cit.*
425. ICCAT Commission Chairman, letter to Netherlands Antilles requesting information on swordfish catches, 2000.

SECTION XVI. (International)

426. Finlay, "Policy perspectives ...," *op. cit.*, p. 101.
427. Finlay, "Policy perspectives ...," *op. cit.*, p. 102.
428. Y. Uozumi, "Preliminary analysis on the distribution of sailfish and longbill spearfish in the Atlantic Ocean in 1993 based on logbook data," *ICCAT Collective Volume of Scientific Papers* (ICCAT: Madrid, Spain, 1995), p. 29 and ICCAT, "1994 SWO background document: Figures," *ICCAT Collective Volume of Scientific Papers* (ICCAT: Madrid, Spain, 1995), p. 91.
429. "Protest to France over attack on fishermen," CANA, Bridgetown radio broadcast, 1425 GMT, April 3, 1987 and U.S. Embassy, Grenada, "Grenada fishermen encounter problem with Martinique market," message number 754, April 13, 1987.
430. J. Mejuto, P. Sanchez, and J.M. de la Serna, "Nominal catch per unit of effort by length groups and areas of the longline Spanish fleet targeting swordfish (*Xiphias gladius*) in the Atlantic years 1988 to 1990, combined," *ICCAT Collective Volume of Scientific Papers*, SCRS 91/49 (ICCAT: Madrid, 1992).
431. See for example, ICCAT, "1994 SWO background document: Figures," *op. cit.*, p. 91.
432. See the Bermuda chapter of this report for more details.
433. For details see the St. Maartens chapter of this report.
434. For details see the Trinidadian chapter of this report.
435. For details see the St. Vincent and Trinidad chapters of this report.
436. Details on the U.S. swordfish fishery are available in Karyl K. Brewster-Geisz, "United States," *World Swordfish Fisheries*, Vol. V. (NMFS: Silver Spring, Maryland), pp. 63-102.
437. Jean Cramer and Heather Adams, "Large pelagic logbook newsletter - 1996," *NOAA Technical Memorandum* (NMFS-SEFSC-407), January 1998, p. 3 and Jean Cramer, "Large pelagic logbook newsletter - 1995," *NOAA Technical Memorandum* NMFS-SEFSC-394, November, 1996, p. 3.
438. ICCAT, "Progress of the Enhanced Research Program for Billfish during 1989," *ICCAT Report*, 1988-89, Part I, (ICCAT: Madrid, Spain, 1989), p. 241.
439. Harford, *op. cit.*, September 26, 1999.
440. Juhl, *op. cit.*, March 25, 1988.
441. Robin Mahon, consultant, personal communications, December 1, 1995.
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457. IFAD, "Report and recommendation ...," *op. cit.*, p. 17.
458. U.S. Embassy, Bridgetown, "Agriculture ministers meet in Dominica," message number 3276, August 15, 1979.
459. Grenadian officials asked for $14 million for a variety of development projects. Japanese officials responded with an offer of $14 million of assistance specifically targeted at the fishing industry. U.S. Embassy, Grenada, "Grenada fishing update," message number 2065, August 31, 1988.
460. U.S. Embassy, Bridgetown, "Grenada: Cuban economic delegation arrives," message number 1977, May 21, 1979.
461. "Grenada: 'Rightist elements' fear Cuba as main source of aid," Paris AFP in 2340 GMT, May 22, 1979.
462. Finlay, "Main developments ...," *op. cit.*, p. 12; "Cuban aid, USSR survey of fishing potential noted," Radio Free Grenada, Grenada radio broadcast, 2330 GMT, July 8, 1980; and Rennie, *op. cit.*, September 27, 1999.
463. "Acuerdo de Grenada con Cuba comunista," *Diario las Americas*, August 22, 1979.
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471. "Fishing industry minister visits Grenada," Havana domestic service, 10:00 GMT, September 17, 1982.
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479. Miller, *op. cit.*, September 26, 1999.

480. Rennie, *op. cit.*, September 27, 1999.
481. Brown, *op. cit.*, February 5, 2001.
482. Finlay, "Main developments ...," *op. cit.*, p. 13 and "Cuban aid ...," *op. cit.*
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489. "Protest to France over attack on fishermen," CANA, Bridgetown radio broadcast, 1425 GMT, April 3, 1987.
490. U.S. Embassy, Bridgetown, "Grenada fishing vessel 'Mananillo'," message number 1170, January 14, 1980.
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492. U.S. Embassy, Grenada, "Grenada fishing update," message number 286, February 4, 1988.
493. The issue of licensing the vessel engendered considerable debate within the Grenada Government. U.S. Embassy, Grenada, "Arrest of U.S. fisherman prompts review of foreign fishing policy," message number 335, February 11, 1987.
494. U.S. Embassy, Grenada, "U.S. fishing boat held in port on ownership question," message number 256, February 14, 1990.
495. U.S. Embassy, Grenada, "U.S. registered fishing boat 'Margarita'" impounded (again) by Grenada court," message number 1969, October 31, 1990.
496. See the section on licenses in "XIII. Government Policy".
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498. Jeffrey, *op. cit.*, June 4, 1999.

Appendices

Series A: Fleet
Series B: Fisheries Data
Series C: Catch
Series D: Trade
Series E: Fishing Licenses
Series F: Glossary
Series G: Seabirds

Appendix A1a.--Grenada. Fishing fleet, late 1970s*

Type	Boats	Length	Power	Motors	Construction
	Number	Meters		Horsepower	
Whalers*	NA	6.0-10.5	Sails/Motors	10-35	Wood planks
Canoes	NA	3.0-6.0	Sails/motors		Wood planks
Transumers	NA	3.0-6.0	Sails/motors		Wood planks
Sloops	NA	9.0-15.0	Sails/motors	50-100	Wood planks
Total	700E				

Note: These vessels were operated by 1,400 full-time and 400 part-time fishermen.
E - Estimate
NA - Not available.
* The dominante vessel type was the whaler.
Source: M. Giudicelli, "Grenadian fisheries development: Mission findings and recommendations," *WECAF Reports* No. 20 (WECAF: Panama, November 1978), p. 6.

Appendix A1b.--Grenada. Fishing fleet, 1983

Power	Length	Boats
	Meter	Number
Inboard motor	7.5-11.0	46
Outboard motor	4.5-6.0	236
Oars	3.0-4.0	40
Sail	6.0-8.5	115
Unspecified*	8.0-8.5	48
Total		485

Note: Based on a 1983 census which 951 registered fishermen. There were an estimated additional 550 unregistered fishermen.
* Mostly used with beach seines.
Source: James Finlay, "A changing status for fisheries in Grenada," *Gulf and Caribbean Fishing Industry Proceedings*, Vol. 36, paperdelivered in 1983 (GCFI: Miami, Florida, 1984), p. 38.

Appendix A1c.--Grenada. Fishing fleet, late 1990s*

Type	Boats
	Number
Pirogues	577
Double enders	13
FRP longliners**	4#
Dories***	34
Launches	32
Unspecified*	76
Total	735

Estimates: These numbers are calculated from the pie chart in the CARICOM website.
Note: Following fleet developments over time is complicated by the Department of Fisheries and other observers to refer to vessels by different names. Dories are belived to the same as whalers. Launches may the same as schooners.
* Undated data, but the website was posted in 1999.
** FRP - GRP-Fiberglass longlibers
*** Whalers
# This would appear to be a low estimate. The authors in 1999 observed more GRP longliners.
Source: CARICOM, "Fishing industry profile: Grenada," internet posting accessed January 18, 2001: http://www.caicom-fisheries.com/grenada.htm

Appendix A2.--Grenada. Longline vessels

Name	Length*	Hull	Hold	Landing site#
	Meter		Tons	
Alister				
BJ				
Benjie's	9	Fiberglass		Cariibeamn Fisheries
Grand	9	Fiberglass		Grand Mal
Irvings Ba	8	Fiberglass		Grand Mal
Jamie II		Wood		
Joanne G	8	Fiberglass		
Lady S				
Millet Bay	9	Fiberglass		
My Desire	6	Fiberglass		Grand Mal
Ocean Prince				
Rainbowchaser				
Scottie	8	Fiberglass		Grad Mal
Trend Setter	13	Wood		
Triumph				
Unstoppable				
Japanese**	11	Fiberglass	7	
Cuban***	17	Ferro-cement		
Unknown****				

* Rough visual estimates
** The Japanese donated ? fiberglass longliners to Grenada in 1991?. The authors are uncertain as to the names of the vessels as most are not marked.
*** Four of the ferro-cement boats donated by the Cubans were used for longliners. None are currently active.
**** Grenada reportedly has about 30-40 mostly small decked longliners and about 30-40 larger undecked boats, not including pirogues rigged for longlining.
# Observed September 1999.
Note: Grenada officials declined to provide a list of the country's longliners. Also for unknown reasons, quite a number of Grenadian longliners do not have their names on either the bow or stern of their boats.
Sources: Justin Rennie, Fisheries Division, personal communications, September 27, 1999; Jason Fletcher, Chairman, Grenada Marine, personal communications, September 28, 1999; and personal observations.

Appendix B1.--Grenada. Seasonality of longline effort, 1990-92

Month	Trips
	Number
January	117
February	88
March	88
April	88
May	81
June	53
July	20
August	-
September	-
October	18
November	38
December	70

* Data points are approximations, estimated from a graphic, figure 9 in source.
Note: data from 4 artisanal longliners
Source: W. Hunte, H. Oxenford, P. McConney, and G. Dharmarante, "The feasibility of developing longline fisheries in Barbados," *Barbados Development Bank Technical Report*, (Bridgetown: Barbados Development Bank, 1993), p. 31.

Appendix B2--Grenada. Monthly day longline catch composition data, December 1990-August 1992

Month	Trips	Catch					Total***
		Swordfish	Tuna**	Billfish	Shark	Others	
	Number	Kg/trip*					
January	116	-	100.9	59.4	0.4	40.0	200.6
February	88	-	104.4	64.4	1.3	21.6	191.6
March	88	0.6	167.9	42.8	0.5	18.0	229.8
April	88	-	214.7	75.9	2.8	18.2	311.6
May	81	1.0	172.1	48.1	0.6	31.7	253.4
June	54	-	128.2	32.3	2.0	27.7	190.2
July	20	-	100.3	26.3	1.3	19.9	147.8
August	-	-	-	-	-	-	-
September	-	-	-	-	-	-	-
October	17	-	67.8	53.7	-	3.6	125.1
November	37	0.4	79.0	51.7	-	7.2	138.3
December	70	-	82.5	68.9	1.3	18.0	170.7
Overall	659	0.2	132.4	55.9	1.1	23.9	213.5

Note the much higher yields reported by the day longliners, even though the trips were shorter, often with only one set. Hunte, *et.al.* "The feasibility ...," *op. cit.*, p. 72.
* Mean values compiled from 4 domestic day longliners
** Mostly yellowfin
*** Totals may not agree due to rounding
Source: Reported in W. Hunte, H. P. Oxenford, and G. Mc Conney, and G. Dharmarante, in "The feasibility of developing longline fisheries in Barbados, *Barbados Development Bank Technical Report* (Barbados Development Bank: Bridgetown, 1993), p. 88.

Appendix B3.--Grenada. Monthly short-stay longline catch composition data, April 1992-August 1993

Month	Trips	Catch					Total
		Swordfish	Tuna*	Billfish	Shark	Others	
	Number			Kg/trip**			
January	16	13.4	105.9	55.5	16.1	18.7	209.6
February	21	9.2	73.1	23.3	21.4	15.4	142.3
March	7	18.0	187.0	26.9	46.3	11.0	289.2
April	26	2.1	175.5	23.3	-	9.1	210.0
May	26	-	189.5	36.6	19.5	18.8	264.4
June	8	0.4	61.5	43.9	-	10.4	116.1
July	7	-	32.0	46.6	15.0	87.7	181.3
August	15	39.1	127.7	12.1	8.2	11.1	198.2
September	20	18.6	91.5	22.4	11.4	2.7	146.5
October	26	16.2	135.7	73.8	4.9	8.4	239.1
November	20	11.5	89.4	47.8	14.1	18.1	180.8
December	16	21.4	49.1	45.9	35.6	7.9	159.9
Overall	209	12.5	117.6	38.5	14.2	14.7	197.7

* Mostly yellowfin
* Although the fishermen operated from April 1992 to August 1993, the data has been compiled on a June to December basis. This fishing data in this appendix includes only one month of fishing for some months (June-March) and September- December.) Other months (April to August) include 2 months of months of fishing.
** Mean values from 6 domestic short-stay longiners
Source: Reported in W. Hunte, H. P. Oxenford, and G. Mc Conney, and G. Dharmarante, in "The feasibility of developing longline fisheries in Barbados, *Barbados Development Bank Technical Report* (Barbados Development Bank: Bridgetown, 1993), p. 91.

Appendix B4.--Grenada. Variations in species composition by type of domestic longliner, 1990-93

Longliner	Species					Total
	Swordfish	Tuna	Billfish	Shark	Others	
			Kg/trip*			
Day	-	133	56	1	34	224
Shortstay	13	118	38	15	16	200

* Data entries roughly estimated from a graphic
Day: Four artisanal day trip longliners (659 trips)
Shortstay: Sic larger longliners that got out for a few days (209 trips)
Source: Reported in W. Hunte, H. P. Oxenford, and G. Mc Conney, and G. Dharmarante, in "The feasibility of developing longline fisheries in Barbados, *Barbados Development Bank Technical Report* (Barbados Development Bank: Bridgetown, 1993), p. 75.

Appendix B5.--Grenada. Catch composition of domestic longliners, May 1988-September 1990

Species	Catch by vessel type	
	Day	Shortstay
	Percent*	
Swordfish	0.1	6.7
Yellowfin tuna	62.0	62.7
Billfish	26.2	20.5
Shark	0.5	7.6
Other	11.2	2.5

* By weight
Day: Four artisanal day trip longliners (659 trips)
Shortstay: Six larger longliners that got out for a few days (209 trips)
Source: Reported in W. Hunte, H. P. Oxenford, and G. Mc Conney, and G. Dharmarante, in "The feasibility of developing longline fisheries in Barbados, *Barbados Development Bank Technical Report* (Barbados Development Bank: Bridgetown, 1993), p. 76.

Appendix B6.--Grenada. Mean swordfish catch reported by shortstay longliners, October 1992-September 1993

Month	Catch*
	Kilograms/trip
1992	
October	17
November	12
December	22
1993	
January	13
February	9
March	18
April	2
May	-
June	1
July	1
August	38
September	18

* Data points estimated from a graphic
Note: 6 longliners, 209 trips
Source: W. Hunte, H. Oxenford, P. McConney, and G. Dharmarante, "The feasibility of developing longline fisheries in Barbados," *Barbados Development Bank Technical Report*, (Bridgetown: Barbados Development Bank, 1993), p. 59.

Appendix C1.--Grenada. Fisheries catch, 1970-98

Year	Catch
	Metric tons
1970	1,300
1971	1,600
1972	1,700
1973	1,700
1974	1,700
1975	1,700
1976	1,700
1977	2,958*
1978	2,063
1979	1,464
1980	1,387
1981	718
1982	960
1983	1,473
1984	1,559
1985	1,731
1986	2,703
1987	2,225
1988	2,001
1989	1,710
1990	1,784
1991	1,990
1992	2,050
1993	2,105
1994	1,634
1995	1,487
1996	1,278
1997	1,408
1998	1,712
1999	1,631

Note: Entries for Grenada have been substantially revised in various volumes of the source because of updated data or corrected submitted by the Fisheries Division. In some instances, such as during the Bishop Governent in the late 1970s an early 80s, over estimates of the catch were submitted that were corrected by subsequent Governments.

* Grenada began reporting more precise catch data in 1977. The authors are unsure as to why this took place and to what extent the fisheries statistical system was improved, providing more accurate catch data. Notably the data reported was much higher than the previous estimates.

Source: FAO, *Yearbook of Fishery Statistics*, (FAO: Rome, various years).

Appendix C2.--Grenada. Oceanic pelagic catch, 1988-97

Species	Year										
	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
	Metric tons										
Tunas											
Yellowfin	376.8	411.3	530.1	620.2	595.2	857.9	385.0			302.4	
Skipjack	38.3	18.6	22.6	25.0	30.1	25.1	11.0			14.9	
Blackfin	219.5*	134.2*	293.1*	194.8	146.0	252.7	189.0			126.3	
Bigeye Tuna	NA	NA	NA	64.8	25.0	20.1	10.0			1.0	
Albacore										6.0	
Frigate							0.6				
Mackerel											
King							4.4				
Spanish	0.4	1.1	3.3	0.4	0.2	0.7	2.0				
Bonito							5.5				
Wahoo**	136.9	57.2	54.1	76.5	104.0	95.7	46.0			54.3	
Salifish	198.6	171.2	217.9	315.7	310.0	246.2	151.0			83.2	
Blue Marlin	33.6	40.1	52.3	63.9	51.8	57.9	52.0			47.2	
Swordfish	97.1***	8.9	0.9	2.0	3.2	13.1	NA		1.2	14.8	
Shark										8.8	
Total	1,101.2	842.6	1,174.3	1,363.3	1,265.5	1,569.4	846.0			659.9	

NA - Not available
* Prior to 1991, bigeye and blackfin tuna were reported together as blackfin tuna. The Grenadan Fisheries Division estimates that reported blackfin landings actually were composed of blackfin (50 percent), bigeye (20-25 percent), and bullet and frigate tunas (25-30 percent). Landings recorded as *Scomberomorus spp.* were previously recorded incorrectly as *S. maculatus*.
** Mostly *Acanthocybium solandri*.
*** Unusually large catches reported in 1988 are unexplained, but probably due to landings by foreign fishermen.
Source: Pelagic and Reef Fishes Resource Assessment Unit, "Report of the CARICOM Fisheries Resource Assessment and Management Program (CFRAMP)," *ICCAT Collective Volumes of Scientific Papers*, SCRS/94/128, pp. 262-265 and 1995 update, in press.

Appendix C3.--Grenada. Swordfish and tuna catches, 1975-99

Year	Swordfish	Tuna			
		Yellowfin	Bigeye	Bluefin	Blackfin
		Metric tons			
1975	-	100	NA	100	NL
1976	-	100	NA	100	NL
1977	-	100	NA	71	NL
1978	-	394#	NA	77	NL
1979	-	520#	NA	53	NL
1980	-	709#	NA	-#	99
1981	-	64	NA	-	110
1982	-	59	NA	-	182
1983	-	169	NA	-	128
1984	-	146	NA	-	197
1985	-	170	NA	-	193
1986	-	506	NA	-	256
1987	-	186	NA	-	141
1988	55	215	NA	-	126
1989	5	235	NA	-	77
1990	1	303	NA	-	167
1991	1	354	37	-	111
1992	2	340	14	-	83
1993	7	490	11	-	144
1994	Negl	385	10	-	220
1995	1	409	10	-	123
1996	1	235	Negl	-	163
1997	15	302	Negl	-	144
1998	33	351	Negl	-	236
1999*	42	429	-	-	78

NA - Not available, believed to be minor
NL - Not listed as a separate species
Note: Very large statistical corrections are commonly reported in each annual update of the source. Discrepancies with appendix ? are unexplained.
* We received the FAO *Yearbook* just as we were going to press. We have inserted some 1999 data, but have not updated previous years or the graphics because of time constraints.
# The large catch reported in 1978-80 are unexplained, but may be associated with the Cubans. This would not explin, however, the sharp drop in 1981. Disruptions associated with growing political disorders may have been a factor. The authors are unsure, however, with the accuracy of these statistics.
FAO discontinued a bluefin listing in the mid-1980s, although the 1983 listed a bluefin catch. The authors are unsure if the fishery changed or the Deparment of Fisheries improved its species identification.
Source: FAO, *Yearbook of Fishery Statistics*, various years.

Appendix C4.--Grenada. Swordfish catches, 1985-99

Year	Catch			U.S.	
	GDF**	FAO	ICCAT	Catch#	Imports##
			Metric tons		
1985		-	NA		-
1986		-	-		-
1987		-	-		-
1988***	97	55	56		-
1989	9	5	5	8.1	5.3
1990	1	1	1	0.8	0.5
1991	2	1	2	-	-
1992	3	2	3	1.3	0.8
1993	13	7	13	5.0	3.3
1994		Negl	-	4.3	2.8
1995		1	1	-	-
1996	1	1	4	0.2	0.1
1997	15	15	15	1.2	0.7
1998		33	11****	1.5	0.9
1999		42	11	5.3	3.2
2000				50.4	32.7

Catch suggested by imports. NMFS made this estimate by calculating the live weight of the imports and adding 10-20 percent for domestic consumption. Even in a country largely exporting swordfish, some fisg will be consumed domestically. This may be juveniles or lower quality fish. Local hotel and restuarants may have arrangements with indvidual fishermen. The lower 10 percent figure was used through 1995, but 20 percent from 1996 when GCFL began reporting problems with exporting. With the heavy shipments reported in 2000, the authors have returned to the 10 percent domestic consumption figure. The 10-20 percent estimates reflect the pattern in other Caribbean and Latin American countries that export swordfish to the United States. The authorss stress that this is only a rough calculation and it is likely to underestimate actual catches. If the available catch data is correct, Grenada appears to conume substantial quantities of swordfish domestically. Thus the catch estimates based on U.S. import data provides only a bench-mark low approximation in the absence of detailed catch data.

U.S. import data (appendix D2a1) converted to live weight using a conversion factor of 1.4.

** In some cases provided by CARICOM.

*** The large 1988 catch was taken by jointventure fishermen which operated in 1988 and to a lesser extent in 1989 (appendix E).

**** There are differences in the ICCAT data published in the *Statistical Bulletin* and released by SCRS. The authors have probably used the data published in the *Statistical Bulletin*. SCRS notes that the 1998 and 1999 catch is unreported and assumes for statistical purposes that it is the same as the last reported catch. SCRS notes the 1997 catch ar 11 t, a downward revision from the data published in the *Statistical Bulletin*.

Note: Discrepancies with appendix ? are unexplained.

Source: CARICOM, "Report of the CARICOM Resource Assesment and Management Program (CFRAMP)," (SCRS/98/102) (GDF data); *Yearbook of Fishery Statistics*, various years (FAO data); ICCAT, *Statistical Bulletin*, various years (1988-97 ICCAT data); and ICCAT-SCRS 2000 relaease (1998-99 ICCAT data); NMFS Southeast Fisheries Center (U.S. catch data); and U.S. Bureau of the Census (U.S. Import data).

Appendix C5.--Grenada. Billfish catch, 1963-99

Year	Marlin		Sailfish
	Blue	White	
		Metric tons	
1963	-	-	-
1964	-	-	-
1965	-	-	-
1966	-	-	-
1967	-	-	-
1968	-	-	NA
1969	-	-	NA
1970	NA	-	NA
1971	NA	-	NA
1972	NA	-	NA
1973	NA	-	NA
1974	NA	-	NA
1975	NA	-	NA
1976	NA	-	NA
1977	NA	-	31
1978	NA	-	37
1979	NA	-	40
1980	1	-	31
1981	1	-	36
1982	12	-	27
1983	6	-	37
1984	8	-	66
1985	11	-	164
1986	36	-	211
1987	33*	-	104*
1988	34N	-	114
1989	40N	-	98
1990	52N	-	218
1991	64N	-	316
1992	52N	-	310
1993	58N	-	246
1994	52	-	151
1995	50A	-	119
1996	26	-	56
1997	47	-	83E
1998	61#	-	153#
1999	100#	-	148#

A - Official data refined by ICCAT SCRS.
N - Estimate by Grenadian scientist who does not agree with official statistics or when official statistics are not available.
NA - Not available. ICCAT has not reported recent catches to ICCAT since 1997.
* Beginning in 1987, the authors have used ICCAT data from the *Statistical Bulletin*. There are substantial variations between these two ICCAT soures, relecting upated reports from Grenada or statistical work by the ICCAT Secretariat.
# FAO data
Source: ICCAT, "Report of the Standing Committee on Research and Statistics," *ICCAT Report*, Part II, 1992-93 (ICCAT: Madrid, Spain, 1994), pp. 254-258 (1963-92 data); ICCAT *Statistical Bulletin*, 1997 (1993-97 data); FAO. *Yearbook of Fishery Statistics*, 1998 (1998 data).

Appendix C6.--Shark catch, 1975-99

Year	Catch
	Metric tons
1975	Negl
1976	Negl*
1977	255*
1978	279
1979	7*
1980	10
1981	12
1982	12
1983	19
1984	15
1985	10
1986	14
1987	17
1988	18
1989	9
1990	8
1991	8
1992	7
1993	12
1994	4
1995	8
1996	4
1997	9
1998	18
1999	24

* This pattern reported in the source is most unusual, going from a negligibe catch to 255-279 t and then down to 7 tons. The authors do not know what was happening in Gernada to explain this or how accurate the data is.
Source: FAO, *Yearbook of Fishery Statistics*, various years.

Appendix C7--Green turtle catch, 1975-99

Year	Catch
	Metric tons
1975	Negl
1976	Negl
1977	Negl
1978	Negl
1979	Negl
1980	6
1981	6
1982	4
1983	1
1984	6
1985	5
1986	4
1987	8
1988	7
1989	5
1990	4
1991	8
1992	11
1993	8
1994	4
1995	7
1996	8
1997	6
1998	6
1999	5

Note: Substantial revisions are reported from year to year.
Source: FAO, *Yearbook of Fishery Statistics*, various years.

Appendix C8.--Grenada. Spice Island Billfish Tournament results, 1999

Species	Tournnament Minimums*		Record	1999 Results Catch	Weight**	Released
	Pounds	Kg	Kg	Number	Kg	Number#
Dorado***	15	7	23	6	79	-
Marlin						
Blue	200	91	253	7	621	6
White	50	23	37	1	27	8
Sailfish	50	23	35	3	80	16
Tuna (yellowfin)	30	14	73	NA	NA	NA
Wahoo	15	7	30	3	53	-

* Minimum weights allowed in the tournament
** Total weight of all fish caught and weighed. Does not include the releases.
*** Dolphinfish
# Fish tagged and released
Source: Robert Miller, Tournament Chairman, "Spice Island Billfish Tournament: Press Release," January 31, 1999.

Appendix C9.--Wider-Caribbean. Foreign swordfish catches in ICCAT area 1060, by area and quarter, 1959-97

ICCAT Square*	Year	Quarter 1	2	3	4	Total
		Metric tons				
Cuba	All years	No reported activity				
Japan	1958			0.3		0.3
	1961		0.1			0.1
	1962		0.8			0.8
	1963	0.3	0.1		0.2	0.6
	1964		0.1	0.4		0.5
	1965		0.4	3.8	0.4	4.6
	1966	7.2	0.6	11.8	3.3	22.9
	1967	0.4		0.1		0.5
	1968		0.3	1.3	0.3	1.9
	1969			0.3	0.4	0.7
	1971	0.2		0.1		0.3
	1972	0.3				0.3
	1974				0.4	0.4
	1975			0.6		0.6
Korea	1966		0.2			0.2
	1967		0.4			0.4
	1968		0.2			0.2
	1969		0.2			0.2
	1970		0.3			0.3
	1971		1.4			1.4
	1972		1.3			1.3
	1973		3.2			3.2
	1974		1.3			1.3
	1975		1.5			1.5
	1976		2.9			2.9
	1977				0.7	0.7
	1978			1.9	2.1	4.0
	1979		0.8	6.3	4.7	11.8
	1980			0.5		0.5
	1981		0.1			0.1
	1985			0.3		0.3
Spain	All years	No reported activity				
Taiwan	1968	1.7			0.5	2.2
	1969	0.2				0.2
	1970			0.4		0.4
	1971	0.1				0.1
	1979			1.2		1.2
	1983	0.6				0.6
	1984			0.1	0.1	0.2
	1985			0.4		0.4
	1996		1.1	3.0	7.5	11.6
	1997	3.1	0.3	2.4	1.8	7.6
United States		U.S. fishing data unavailable**				

* ICCAT square are 5° degree squares of latitude and longitude. The first two numbers are the latitude and the second two numbers are the longitude. This represents the southeastern corner of the 5° square for catches in quadrant 4, northwest Atlantic.

** The authors encountered apparent statistical problems with the U.S. data on the ICCAT web site. Apparently ICCAT is in the process of recalculating the 1° square data by 5° squares. As a result this data was not added to this appendix.

Source: ICCAT: http://www.iccat/es/Stats.html, retrieved July 3, 2000

Appendix D1.--Grenada. Swordfish exports by destination, 1990-99

Destination	Year										
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	Metric tons										
United States	1	-	1	3	3	-	Negl	1	1		
Japan*	-	-	-	-	-	-	-	-			
European Union	NA	-	-	-	-#						
Others**	NA	NA	NA	NA	NA						
Total	NA	-	1	3	3						

Through November
* Estimated swordfish portion of billfish shipments
** Swordfish shipments to other countries are believed to be non-existent or negligible
Source: Various

Appendix D2a1.--United States. Swordfish imports from Grenada, 1989-2000

Year	Commodity		Total*
	Fresh	Frozen	
	Metric tons		
1988**	NA	NA	NA
1989	5.2	0.1	5.3
1990	0.5	-	0.5
1991	-	-	-
1992	0.8	-	0.8
1993	3.3	-	3.3
1994	2.8	-	2.8
1995	-	-	-
1996	0.1	-	0.1
1997	0.7	-	0.7
1998	0.9	-	0.9
1999	3.2	-	3.2
2000	32.7	-	32.7
2001***	6.8	-	6.8

* Totals may not agree due to rounding.
** Prior to 1989, Grenada import data was included in the "Leeward-Windward Islands" basket category. See Caribbean appendix F2c1.
*** Through June
Source: U.S. Bureau of the Census

Appendix D2a2.--United States. Swordfish imports from Grenada, 1989-2000

Year	Commodity		Total*	Apparent prices
	Fresh	Frozen		
	US$1,000			US$/kg
1988**	NA	NA	NA	NA
1989	37.8	1.2	39.0	7.36
1990	4.7	-	4.7	9.40
1991	-	-	-	NA
1992	3.0	-	3.0	3.75
1993	12.0	-	12.0	3.64
1994	13.7	-	13.7	4.89
1995	-	-	-	NA
1996	2.1	-	2.1	21.00#
1997	6.0	-	6.0	8.57
1998	8.1	-	8.1	9.00
1999	6.6	-	6.6	2.06
2000	284.5	-	284.5	8.71
2001***	53.3	-	53.3	7.84

* Totals may not agree due to rounding
** Prior to 1989, Grenada import data was included in the "Leeward-Winward Islands" basket category. See Caribbean appendix F2c2.
*** Through June.
# This high price was in part due to very limited quantity shipped.
Source: U.S. Bureau of the Census

Appendix D2b.--United States. Monthly swordfish imports from Grenada, 1990-June 2001

Month	Year											
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
	Metric tons											
January	-	-	-	-	1.2	-	-	-	0.4	-	-	0.9
February	-	-	-	-	-	-	-	0.3	0.3	-	-	0.5
March	-	-	-	-	0.4	-	-	-	-	-	1.1	3.1
April	-	-	-	-	-	-	-	0.2	0.2	-	4.0	0.8
May	-	-	-	1.6	-	-	-	0.2	-	2.0	1.3	0.8
June	-	-	-	1.6	-	-	-	-	-	-	2.1	0.6
July	-	-	-	-	-	-	-	-	-	-	3.3	2.0
August	-	-	0.3	-	-	-	0.1	-	-	-	4.8	-
September	-	-	0.5	0.5	-	-	-	-	-	-	3.6	
October	-	-	-	-	-	-	-	-	-	-	5.6	
November	-	-	-	-	1.2	-	-	-	-	-	1.3	
December	-	-	-	-	-	-	-	-	-	1.1	5.6	
Total*	-	-	0.8	3.3	1.2	-	0.1	0.7	0.9	3.2	32.7	

Note: Peak months are denoted by bold type.
* Totals may not agree due to rounding.
Source: U.S. Bureau of the Census

Appendix D3.--United States. Tuna imports from Grenada, 1990-2000

Year Commodity/ species	Imports Quantity	Imports Value
	Metric tons	US$1,000
1990		
Fresh		
Albacore	0.4	2.3
Yellowfin	9.7	50.4
Unidentified	0.5	4.1
Subtotal, 1990**	10.5	56.8
1991		
Fresh yellowfin	44.3	150.8
Frozen unidentified	0.4	1.8
Subtotal, 1991**	44.7	152.6
1992		
Fresh		
Yellowfin	71.6	283.1
Unidentified	0.4	1.3
Frozen yellowfin*	0.5	1.5
Subtotal, 1992**	72.5	285.9
1993		
Fresh		
Yellowfin	173.9	460.3
Unidentified	21.6	58.0
Frozen yellowfin*	0.8	1.3
Subtotal, 1993**	196.3	519.6
1994		
Fresh		
Albacore	1.3	4.8
Yellowfin	204.3	694.3
Unidentified	80.2	293.9
Frozen yellowfin*	42.4	152.4
Subtotal, 1994**	328.2	1,145.4
1995#		
Fresh		
Albacore	7.4	11.6
Yellowfin	135.1	357.1
Unidentified	174.0	654.6
Frozen		
Yellowfin*	98.9	632.3
Unidentified	0.7	3.0
Subtotal, 1995**	416.0	1,658.6
1996		
Fresh		
Albacore	2.5	4.5
Yellowfin	87.4	342.8
Unidentified	149.8	375.2
Frozen yellowfin*	94.5	553.2
Subtotal, 1996**	334.1	1,275.8
1997		
Fresh		
Albacore	6.5	11.7
Bluefin	0.5	3.3
Yellowfin	140.4	445.5
Unidentified	80.9	213.8
Frozen		
Yellowfin		
Head-off*	90.2	524.0
Head-on	0.5	1.4
Subtotal, 1997**	319.0	1,199.6
1998		
Fresh		
Yellowfin	158.6	498.6
Unidentified	47.2	232.2
Frozen yellowfin*	31.0	179.0

Subtotal, 1998**	236.9	909.8
1999		
Fresh		
Yellowfin	154.9	636.0
Unidentified	92.0	487.4
Frozen		
Yellowfin		
Head-off*	11.4	87.4
Head-on	0.3	2.1
Subtotal, 1999**	258.7	1,212.9
2000		
Fresh		
Albacore	3.4	27.0
Yellowfin	165.8	874.5
Unidentified	153.8	448.2
Frozen, yellowfin	1.9	15.4
Subtotal, 2000**	324.9	1,365.0

* Eviserated, heads-on
** Totals may not agree due to rounding.
# Record year
Source: U.S. Bureau of the Census

Appendix D4a.--Grenada. FDA swordfish detentions, July 1999-August 2000

Company	Shipped To	Product	Date	Reason*
Alex Swan (St. George's)				
	NWE	Fresh swordfish	03/02/2000	Poisonous
	NEW	Swordfish	04/06/2000	Poisonous
	NWE	Swordfish	04/12/2000	Poisonous
	Florida	Swordfish H&G	04/18/2000	Poisonous
	NEW	Swordfish	04/19/2000	Poisonous
	NEW	Swordfish	04/24/2000	Poisonous
	Florida	Swordfish H&G	05/04/2000	Poisonous
	Florida	Fresh swordfish	05/24/2000	Poisonous
Mervyn James (St. George's)				
	Florida	Fresh swordfish	08/22/2000	Poisonous
	Florida	Fresh swordfish	09/19/2000	Poisonous
	Florida	Fresh swordfish	10/20/2000	Poisonous

* This was the reason the shipment was detained, and not the findings of actual laboratory analysis.
Source: FDA, OASIS Detentions: http://www.fda.gov/ora/oasis

Appendix D4b.--United States. Grenada companies exempted from automatic detention*, December 11, 2000

Company	Location	FEI
Alex Swan Caribbean Swordfish	St. George's	10000539609

* See source fo explanation
Source: FDA, "detention without physical examination of swordfish for mrthyl mercury," internet site accesed January 18, 2001: http://www.fda.gov/ora/fiars/ora_import_ia1608.html

Appendix D5.--United States. Fishery imports from Grenada, 1998-2000

Product	Year		
	1998	1999	2000
		US$1,000	
Fish			
Swordfish, fresh	8.1	6.6	284.5
Tuna			
Albacore	-	-	27.0
Yellowfin			
Fresh	498.6	636.0	874.5
Frozen	179.0	89.5	15.4
Unspecified, fresh	232.2	487.4	436.9
Other, fresh			
Fillets	506.2	555.5	389.3
Other	6.7	-	-
Shellfish			
Lobster	-	63.4	122.1
Other	4.2	9.5	2.3
Total	1,435.0	1,847.9	2,163.2

Source: U.S. Bureau of the Census

Appendix E.--Grenada. Fishing licenses, 1988-89

Year	Licenses	Vessel	Country
	Number		
1988	3	Mandy J	U.S.
		Sea Hawk	U.S.
		White Seal	U.S.
1989	3	Mandy J	U.S.
		Unknown	U.S.
		Unknown	U.S.
1990	-		
1991	-		
1992	-		
1993	-		
1994	-		
1995	-		

Note: Other sources report 8 jointventure vessels operated out of Grenada in 1988-89. The smaller number of vessels here are presumably vessels fully owned by the U.S. Merritt Seafood Company. Vessels with partial local partcipation wereable to qualify for local licenses. J.K. Andrews, "Analysis of billfish fisheries in Grenada," *ICCAT Collective Volume of Scientific Papers*, 1990, Vol. 32, No. 2, p. 408.
Source: Various (1988-89 data) and James Finlay, Chief Fisheries Officer, personal communications, January 18, 1996 (1990-95 data).

Appendix F.--Grenada. Species glosary

English	Local	Scientific
Fish		
Billfish		
Blue Marlin		Acanthocybium solandri
Salifish	Ocean gar	Istiophorus albicans
Bonito		Sarda sarda
Mackerel		
King		Scomberomorus cavalla
Spanish		
Shark		
Swordfish		Xiphias gladius
Tunas		
Albacore		Thunnus alalunga
Bigeye Tuna		T. obesus
Blackfin		T. alanticus
Skipjack		Katsuwonus pelamis
Yellowfin		T. albacares
Mackerel Frigate		Auxis thazard
Wahoo**		Acanthocybium solandri
Turtles		
Green	Chicken	Chelonia mydas
Hawksbill		Eretmochelys imbricata
Leatherbacks		Dermochelys coriacea
Loggerhgeads		Caretta caretta

Source: Various

Appendix G.--Grenada and the Grenadines.# Seabird nesting, 1984

Area	Information	Species*	Known** threats	Importance***
Grenadines#	Poor	3, 5, 7?, 8, 9, 10, 12, 13?, 16, 18, 19, 22	Ha, Ex	Extremely important?
Grenada##	Poor	3?, 12?, 16?	Ex?	Relatively unimportant

St. Vincent jurisdiction. We have included them here because they are so close to Grenada and some of the southern Grenadines are under Grenadian jurisdiction.
And offshore cays.
* Species: 3 - Puffinus I. lherminieri; 5 - Phaethon aethereus; 7 - Fregata magnificens; 8 - Sula dactylatra; 9 - S. sula; 10 - S. leucogaster; 12 - Larus atricilla; 13 - Sterna maxima; 16 - S. dougallii; 18 - S. anaethetus; 19 - S. fuscata; 22 - A. stolidus
** Threats: Ex - exploitation of eggs, young or adults; Pr - predators, generally introduced mammals; Ha - habitat destruction or disturbances; Po - pollution; Fi - fisheries
*** A rough subjective rating of relative importance of area for breeding seabirds.
Source: Ruud van Halewyn and Robert L. Norton, "The status and conservation of seabirds in the Caribbean," in J.P. Croxall, P.G.H. Evans, and R.W. Schreiber (eds.), "Status and conservation of the world's seabirds," *ICBP Technical Publication*, No. 2 (ICBP: Cambridge, 1984), pp. 175-176.

12

GUADELOUPE

by William B. Folsom

Guadeloupe is a small island belonging to France in the southeastern Caribbean Sea. Fishing plays only a minor role in the country's economy and landings of approximately 8-9,000 metric tons does not meet the demand for seafood. About half of the nation's supply of fish and shellfish must be imported. There are a few isolated reports of swordfish being caught by local fishermen. One company imports swordfish for smoking. The company exports small quantities of smoked fish to Miami and swordfish may be included in those exports, although U.S. trade statistics show no imports of swordfish from Guadeloupe. In 1995, a French fishery newspaper, *Le Marin*, reported that the French company L'Armement Viking dispatched its catamaran, the *Viking Marlin*, to fish for swordfish from an unnamed port in the Antilles. In 1996, the same newspaper reported that L'Armement Viking sent a second catamaran, the *Viking Etretat*, to the Caribbean. *Le Marin* later reported that the *Viking Etretat* was assigned to fish from a base in St. Martin, Guadeloupe. French fishing industry sources, however, deny that either vessel fished in the Caribbean, and claim that both vessels were sent to fish out of La Réunion, in the Indian Ocean.

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Figure 1.--Map of Guadeloupe, Dominica, and Martinique.

I. Overview

A. History

Guadeloupe was discovered on November 4, 1493, by Christopher Columbus during his second voyage of discovery to the New World. He named the island "Santa-María de Guadeloupe de Estremadura" after the famous sanctuary in Spain. This was the day after he discovered the island of Marie Galante which he named after his flagship, Santa Maria La Galante.[1] Columbus also saw the Los Santos islands on November 4, 1493, three days after the Feast of All Saints, and gave them the name "Los Santos" after that holy day. The islands lie six miles south of Guadeloupe.

The Spaniards originally attempted to settle Guadeloupe, but the Carib Indians defeated those efforts. French settlers arrived in 1635 and began plantation farming with imported slaves. Guadeloupe became a French possession in 1674 when the island was officially annexed by the King of France. It was a French colony until it was made an Overseas Department of France on March 19, 1946. The island was made an administrative region in 1974. The French Government is represented by an appointed Commissioner. Local government consists of a popularly elected General Council and Regional Council. Guadeloupe is represented in the French National Assembly and Guadeloupe is a Department of France.

B. Fishing industry

Guadeloupe had a population of 402,815 in July 1995. In 1983, only three percent of the population, or about 12,000 people, made their living directly or indirectly from fishing.[2] Other data indicate that the number of professional fishermen registered in Guadeloupe ranged between 1,046 in 1980 and 1,596 in 1983.[3] The number has since increased. An industry source reported that the number of fishermen by 1999 had risen to between 1,500 and 2,000.[4]

Fishermen in Guadeloupe are represented by three cooperatives which were established in 1977. These include SOCOSAP in Terre-de-Bas, COPERADE in Désirade, and COMPAPEGA at Pointe-à-Pitre. These cooperatives have helped their members obtain netting, motors, fishing lines, and other supplies at lower prices, build fuel storage tanks and have helped obtain financing needed by fishermen to buy better equipment.[5]

C. Geography

This Caribbean island is located in the Lesser Antilles between Dominica and St. Lucia. It is the northern-most of the Windward Islands. Guadeloupe is an archipelago consisting of Basse-Terre and Grande-Terre, Marie-Galante, La Désirade, Iles de la Petite Terre, and Iles de Saintes. The islands of Saint-Barthélemy (125 miles northwest of Guadeloupe) and Saint-Martin (140 miles northwest of Guadeloupe) are also part of Guadeloupe. Saint-Martin is divided into two parts, the French northern portion and the Dutch (Netherlands Antilles) St. Maarten to the south.

Guadeloupe is a volcanic island characterized by an indented coastline that stretches for 306 kilometers (km) and mountainous terrain. The highest point is Mt. Soufriere on Basse-Terre which reaches 4,650 feet in altitude. Guadeloupe consists of 1,780 square kilometers (sq.km. or 660 sq. miles or about ten times the size of Washington, D.C.). The capital is Basse-Terre which has a population of 20,000 inhabitants. Basse-Terre and Grande-Terre are separated by a narrow saltwater stream called *Rivière Salée*. Point-à-Pitre is the economic capital of the country. French and Creole are the primary languages spoken in these islands.

II. Species

A. General

French authorities estimated Guadeloupe's benthic fishery biomass at 5,000 to 7,000 metric tons (t) in 1983. In addition, the pelagic biomass was set at between 6,000 and 10,000 tons. These authorities noted that stocks in waters less than 80 meters (m) deep were generally over exploited while those in deeper waters were under exploited.[6]

The greatest quantities of fish caught in recent years have included common dorado (also called dolphinfish), blackfin tuna, mackerel-like species, and other marine species. Small quantities of marine crustaceans and conchs are harvested.[7]

Guadeloupe is also growing small quantities of pond-raised shrimp. Most of the 40-50 t of freshwater shrimp are sold in the domestic market. The potential for growth of shrimp farming in Guadeloupe is limited.[8]

B. Swordfish

The spawning grounds for swordfish are primarily deduced by the location and abundance of swordfish larvae. One 1983 study reported that there is relatively little spawning within the Caribbean itself, although some limited spawning does take place south of Cuba. Considerable spawning activity is reported off western Cuba, both in the Yucatan and Florida straits. There is also some spawning around the Lesser Antilles, primarily from north of Anguilla to Saint Lucia. The larvae found in the Lesser Antilles are both small and large-sized. The lesser numbers of small larvae suggest that spawning is less intense than in the western Caribbean off Cuba. The numbers of large larvae suggest that they were spawned there or recruited from adjacent regions.[9] A 1998 analysis shows a similar pattern of larval concentrations in the Gulf of Mexico and the southeastern coast of the United States, but more limited concentrations off the northern islands in the Lesser Antilles.[10]

Between October 1995 and October 1997, the French scientific organization Institut Francaise de Researche pour l'Exploitation de la Mer (IFREMER), conducted experimental fish surveys using a 2.5 km longline. They caught only a few male swordfish of an average weight of 2.5 kilograms (kg).[11]

In 1995, a French fishing industry newspaper, *Le Marin*, reported that the catamaran, the *Viking Marlin* was heading for the Antilles.[12] The *Viking Marlin*, according to *Le Marin*, was to fish for swordfish for delivery to the American market.[13] However, no specific port was identified for that vessel.[14] The vessel was equipped with onboard processing and freezing equipment designed to produce a high-quality, frozen product.[15]

In 1996, *Le Marin*, reported that a second catamaran, the *Viking Etretat*, was enroute to a base in St. Martin, Guadeloupe. Both vessels were owned by the French fishing company L'Armement Viking. The *Viking Etretat* was a 21.5 m vessel able to operate for periods of 40 to 45 days at sea with a crew of eight. The vessel deploys a 110 km longline and has a 80 cubic meter (m3) hold which can maintain the catch at 0° Centigrade (C) and a small 13 cubic meter hold that can store bait at -20° C. According to the article published in *Le Marin*, L'Armement Viking expected the vessels to produce 1.5 t of fish daily for shipment to Miami and other ports in the United States.[16]

According to French industry sources, the operation apparently was not based on accurate information; both l'Armement Viking catamarans, were sent to the Indian Ocean where the company successfully operates a large fleet of swordfish vessels.[17] The exact dates when this transfer took place are not known.

III. Grounds

A. Topography

Guadeloupe is actually two islands, Grand-Terre and Basse-Terre, which are separated by a narrow channel. The two islands are approximately equal in area, but the topography is quite different. Basse-Terre is mountainous and includes the Soufrière. Grand-Terre is flat and largely agricultural.

B. Fishing grounds[18]

Along the southwestern edge of Basse-Terre lies the "windward coast" (Côte-sous-le-Vent). The Côte-sous-le-Vent extends from Deshaies in the north to Vieux-Fort near the southern tip of the Basse-Terre. The coastline has about 20 different inlets or points where fish are landed. There is a very short Continental Shelf extending south off the Côte-sous-le-Vent which allows fishermen to reach water after a voyage of only 2 to 3 nautical miles. Elsewhere around the island the Shelf tends to be wider.[19] The eastern coast of Guadeloupe, off Grand-Terre, faces out into the waters of the Atlantic Ocean.

Fishermen set traps ("pots") all around the island. The fishermen report the following areas offer the best fishing for selected species:
West coast: The best wahoo and blue marlin fishing takes place off the west or leeward coast.
North coast: The best dorado and yellowfin catches are taken along the northern coast.[20]

Guadeloupe coastal waters are subject to a variety of human pressures. Some of the most significant are agricultural pollution, heavy metal pollution, sugar mill and distillery liquid wastes, urban pollution, sediment runoff, construction, and dredging and extraction.[21] Many of these affect inshore stocks which are already heavily fished. This is not unlike the situation on many

other islands, however, the relatively dense population and large tourist industry make the situation on Guadeloupe especially severe.

IV. Fleet

Guadeloupe has only a small fleet of fishing vessels, consisting mostly of wooden canoes and small, wooden craft. These vessels generally fish the in-shore, coastal waters and go out to sea for only a few hours at a time.

A. Artisanal and commercial

1. Canoes

Small-scale fishermen operate traditional wooden canoes, ranging from 3.5 m to 6 m in length. Some of the canoes are equipped with 10 to 85 horsepower (hp) outboard motors. The most typical outboards are 25, 45, and 48 hp. Lack of refrigeration equipment forces these canoes to return to port after only a few hours at sea.[22] In 1983, there were 786 canoes with 1,533 fishermen registered in the canoe fishing fleet.[23]

2. Artisanal boats

The artisanal fishermen use larger vessels that range in size from 7 to 12 meters. These vessels frequently are equipped in inboard diesel engines. These artisanal craft operate in much the same manner as the canoe fleet, but can go further offshore and fish in deeper water. In 1983 there were 14 coastal vessels with 52 fishermen in the fleet.[24] A fishermen operating a small artisanal vessel, the *Positive*, describes his boat as a 7-m, fiberglass boat with a 85 hp motor which he uses for trolling and handlining.[25]

3. Offshore boats

There is also a small, offshore fleet that operates out of Guadeloupe. In 1983, there was only one vessel manned by 11 fishermen registered with local authorities.[26] By 1986, the number of these vessels had grown to some 20 boats. These vessels ranged in size from 10 m to 12 m in length. They were able to fish for one week at a time and frequently fished for red snapper and other fish off Antigua.[27]

B. Recreational

A typical recreational fishing boat is the *Eagle Sea*, an 11-m fiberglass boat built in North Carolina. It has two 400 hp inboard engines.[28]

V. Shipyards

One report indicated that in the 1970s about 30 shipwrights built or repaired small wooden craft. There were also a few larger concerns operating small shipyards that can do some work on larger vessels that ply the Caribbean Sea.[29] There were nearly 40 other concerns able to undertake minor repairs to small fishing boats or other craft. All but four of these concerns were operated by a single individual; three were operated by 2-3 individuals, and one (SAHATI in Capsterre) had a workforce of 13 individuals. One local observer reports that many of the local shipwrights that once worked with wood have passed away or retired. About 5 or 6 small companies in 2000 were building fiberglass boats.[30]

VI. Fleet Operations and Gear

French researchers have experimented with longlining and French fishermen have done some trial longlining. There is at this time, however, no longline fishery on Guadeloupe. Artisanal and small-scale fishermen conduct a variety of fishing operations, but no longlining is currently practiced by the local fishermen.[31]

A. Artisanal and commercial

Artisanal and commercial fisheries are not, unlike some other Caribbean islands, easily distinguishable. Artisanal fishermen on Guadeloupe are simply small-scale commercial fishermen. The difference is basically the size of the boat. The fishermen operate out of about 30 fishing ports throughout the island, although there are likely many small inlets, coves, and beaches where fishing canoes can be anchored or

hauled ashore. The small canoe fleet operates from around 30 ports while the larger, artisanal coastal fleet fishes from six ports. The offshore fleet sails out of Point-à-Pitre.

About 4,000 fishermen deploy approximately 2,000 small boats. Most of the boats are wooden canoes or small artisanal boats that work along the coast. There is a small offshore fleet. These vessels are unable to meet local demand for seafood and imports of fish and shellfish are necessary.[32]

The fishermen conduct both demersal trap ("Nasses") and oceanic pelagic fisheries.

Trap fisheries: Traps are used to catch benthic species as well as spiny lobsters. The traps are large hexagonal shapes made of chicken wire and branches. These are lowered to a depth of 80 meters.[33] Fishing with lines is another method used. These lines can reach 60 m in depth.[34]

Pelagic fisheries: In the early 1980s, several new wooden boats were built which allowed fishermen to use nets to catch fish. Fishermen operating out of Port-Louis and Saintes use purse-seines that are 1,000 m long and 50 m deep; they catch tuna with these nets.[35] A substantial portion of the oceanic pelagic fishery is blackfin tuna. Many fishermen troll for pelagics. These fishermen target yellowfin tuna, blue marlin, dorado, and wahoo.[36]

Fishermen usually leave for the fishing grounds early in the morning. They sail out for three to four hours looking for frigate birds to locate schools of dorado ("dolphinfish"). Since ice is generally at a premium, the canoes return home after catching a suitable number of fish.[37]

The best season for catching dorado, tuna, and mackerel-like species is between December and May of each year. Fishing for sharks and barracudas takes place between June and December of each year.[38] Blue marlin are abundant from May to July.[39] The late summer months also mark the beginning of the hurricane season which limits fishing effort.

Artisanal fishermen deploy troll lines and hand lines, mostly during the day. Artisanal fishermen with their small boats generally fish alone or at most with one crew member. Fishermen leave early in the morning and return late in the afternoon. Fishing is conducted all around the island. Guadeloupe has an extensive Fish Aggregating Devices (FAD) program. Each fisherman is permitted to deploy up to four FADs and most will generally fish in the area where their FADs are deployed. Some fishermen tend to target wahoo and blue marlin in inshore waters (up to about 8 km). Other fishermen target yellowfin tuna further offshore (up to about 30 km). One artisanal fisherman reports generally operating his boat, *Positive*, between Basse-terre or Pointe-A-Pitre about 45 km and up to 60 km offshore. He deploys two troll lines using lures. The lines are 50 pound (lb) test. While he primarily targets tuna offshore, he also fishes in shore for blue marlin and wahoo. He will occasionally go after swordfish. When fishing for swordfish he goes out at night and using a rod and reel with squid as bait. Swordfish tend to be most abundant in December and January. There is little incentive for such runs, however as the demand for swordfish on Guadeloupe is quite limited.[40]

One negative consequence of the inshore fishing is that there is a high incidence of ciguatera poisoning in fish that feed on dead coral. Corals tend to grow closer to the surface of the water; the deeper the ocean floor, the lower the number of corals and hence the lower the incidence of ciguatera.[41]

B. Recreational

Guadeloupe has only a small local recreational fishery. The intense pressure on the species of interest to the recreational fishermen by the local artisanal and commercial fishermen result in low catch rates and the constant danger of gear conflicts. There is at least one tournament held on Guadeloupe, the Guadeloupe Open Fishing Tournament. The 1998 event was held October 28-November 2.[42] Most serious recreational fishermen, however, enter tournaments held on neighboring islands. Tournaments on nearby Antigua are particularly popular. The Antigua and Barbuda Sports Fishing Tournament during May is the most popular tournament for Guadeloupe sport fishermen. The largest blue marlin, a 341 kg fish caught with a 50 lb test line, was taken in the Antiguan tournament by a Guadeloupe fisherman. Most Guadeloupe sport fishermen practice tag and release fishing for billfish.[43]

VII. Catch

Local fishermen landed between 7,000 t and 10,500 t of fish, shellfish, and mollusks between 1980 and 1997 with catches last reported at 9,000 t in 1988.[44]

The greatest quantities of fish caught in recent years have included dorado/dolphinfish (*Coryphaena hippurus)*, with a harvest of 730 t in 1996), blackfin tuna (*Thunnus atlanticus)* with a catch of 500 t in 1996, mackerel-like species (*Scombridae)*, harvest of 1,550 t in 1996, and other marine species (6,220 t in 1996). Small quantities of marine crustaceans (140 t, presumably spiny lobsters) are taken along with stromboid conchs (430 t in 1996). The harvest of marine sea turtles declined from 20 t in 1991 to nothing in 1995,[45] presumably because of protective measures.

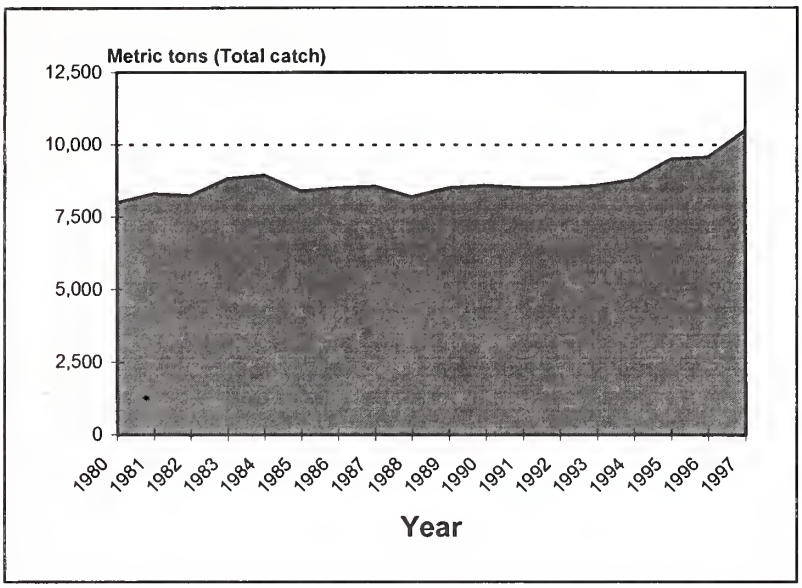

Figure 2.--The Guadeloupe fisheries catch has increased slightly over the past two decades.

Although small, male swordfish were caught offshore by IFREMER scientists, there are no reports of swordfish being landed, except for isolated catches by artisanal fishermen. However, one company does produce smoked swordfish, presumably from imported product. (See "XI. Companies"). The French company L'Armement Viking reportedly sent their catamaran *Viking Etretat* to Saint Martin to fish for swordfish in the Caribbean Sea, but French industry sources report that the vessel was sent to the Indian Ocean and not to the Caribbean.[46]

VIII. Ports

There are many small ports, inlets, and beaches along the coast of Guadeloupe where fish can be landed. Some of the fishing ports (larger ports shown in **bold**) include: **Anse-Bertrand**, **Anse Morel** and **Anse Muriers** (on Les Saintes) Balilif, Basse-Terre, **Bananier**, Bouillante, **Capesterre** (on Marie-Galante), Deshayes, Gosier, **Goyave**, Grand-Bourg, Ilet Kahouanne, Ilet Macou, **Lamentin**, **Le Moule**, **Mome Rouge**, **Petit Bourg**, **Petit Canal**, Pigeon, Point-à-Pitre, **Pointe-Noire**, Port Louis, Sainte Anne, Saint-François, Saint-Louis, Sainte-Marie, Sainte-Rose, Tête-à-l'Anglais, Trois-Rivières, **Vieux-Bourg**, **Vieux-Fort**, and Vieux-Habitants.[47] Anse Marcel, Grand-Case, and Marigot are ports in Saint-Martin while Gustavia is the primary port in Saint-Barthélemy.

Basse-Terre and Point-à-Pitre are the largest ports on the island. These ports accommodates ocean-going freighters and cruise ships that visit the island. Many fishing operate from Basse-Terre and Point-à-Pitre because there are large markets available for their catch and because there are modern facilities available to repair and maintain their vessels and gear.

Port Louis on Grande-Terre is the fourth largest fishing site on the island, accounting for 810 t of fish landed in 1990. Approximately 130 canoes are based in Port Louis.[48]

IX. Transshipments

There are no known reports of swordfish being transshipped through Guadeloupe. However, Asian-flag longliners do transship tuna through Dutch St. Maarten. Large quantities of billfish are also transshiped, although data on swordfish is limited since Taiwan stopped reporting transhipment data in 1995.[49]

X. Processing and Products

Most of the fish landed in Guadeloupe is sold fresh at open-air markets within hours of being caught. The fish is prepared to the tastes of the consumer. Larger fish are cut into steaks.

Fish must also be imported into Guadeloupe. These imports enter the country either as fresh fish or as frozen fish. Some of the fish is immediately distributed to retail stores for sale to upscale clients or are sent on to hotels or restaurants. Some of the frozen fish is used to produced salted or smoked product. (See "XI. Companies".)

XI. Companies

Caraibe Maree in Fort-de-France, Comptoir Commercial Caraibes in Baie-Mahault, SOFRIB and SOFROI in Pointe-a-Pitre, are importers of seafood.[50]

Société SAPA-Le Tridant was established in 1989 or 1990 as a processor, distributor, and exporter of fresh and smoked fish in Guadeloupe. In 1992, the company was smoking: ***swordfish***, marlin, mackerel, tuna, grouper and shark. SAPA prefers smoking mako sharks between 30 and 40 kg.[51]

SAPA operates with 30 employees and handles 40 t of fresh fish and 80 t of frozen fish each month. Thirty percent of the fresh fish (about 12.5 t) was locally supplied by a dozen fishing vessels.

SAPA imported 70 percent of its fresh fish and 100 percent of its frozen fish from Brazil, Cuba, Guyana, Jamaica, Saint Barts, and the Dominican Republic.[52] Although not clearly stated, it is logical to assume that the swordfish being smoked is imported. No catches of swordfish are reported and even if swordfish were caught on an irregular basis, it would be difficult to base an industry on such an uncertain catch.

SAPA sells 95-percent of the company's production locally. The remaining five percent is shipped to Miami.[53] No information was provided as to the make-up of these exports. It is possible that small quantities of swordfish could be included in these exports, even though U.S. trade statistics show no imports of swordfish from Guadeloupe.

XII. Markets

A. Domestic

Fish are brought ashore within hours of being caught. They are sold in large, open-air markets at individually operated booths. Sanitation and care of the catch is at a very basic level. Ice is rarely used. Fish are sold by pieces or as steaks.[54] The most popular species for domestic consumption in Guadeloupe includes blue runner, jack crevalle, bigeye scads, and red porgy. Black mullet, shark, bluefish, king mackerel, tuna, and squid are also popular.[55] Very little swordfish is caught by Guadeloupe fishermen and thus there is no significant demand. Some fishermen report that swordfish are available, but the limited demand provides little incentive to target them. Blue marlin are much better received on the local market, and can be more easily sold to restaurants or the general public.[56]

Imported frozen seafood is sold by a limited number of companies that specialize in importing and selling seafood. The products are then marketed through grocery stores, supermarkets, retail seafood stores, and restaurants.[57] In 1983, Guadeloupe's fishermen caught 8,386 tons of fish and shellfish. Imports of fresh fish amounted to 276 t while imports of frozen fish were 802 tons. In addition, Guadeloupe imported 2,507 t of salted or smoked fish for a total of 11,971 tons.

B. Trade

1. Imports

The people of Guadeloupe rank among the world's greatest consumers of seafood, with per capita consumption averaging about 95 pounds live weight. Local production does little to meet demand and more than half of the country's seafood requirements must be met by importing seafood.[58]

In 1996, Guadeloupe imported $24.2 million worth of fishery products, down from $30.4 million purchased in 1995. Imports in 1996 included: Fresh, chilled or frozen fish (1,704 t worth $7 million); dried, salted, or smoked fish (1,424 t worth $7.3 million); fresh or frozen crustaceans and mollusks (792 t worth $6.4 million); canned fish (769 t worth $2.8 million); canned crustaceans and mollusks (115 t worth $0.8 million); and fishmeal (5 t worth $4,000).[59]

At least one processing firm, SAPA, is importing frozen grouper, mackerel, marlin, shark, swordfish, and tuna for use in their smoking operations. SAPA imports their fish from Brazil, Cuba, Guyana, Jamaica, Saint Barts, and the Dominican Republic.[60]

Other reports indicate that fish is imported frozen from France while French Guiana supplies shrimp.[61]

2. Exports

In 1996, Guadeloupe exported 51 t of fish (48 tons) and shellfish (3 t) worth $187,00.[62] U.S. import statistics show that Guadeloupe shipped modest quantities of conch, octopus, rock lobster, tuna, and various marine fish fillets to the United States between 1995 and 1998. U.S. import statistics report no imports of swordfish directly from Guadeloupe although 9.1 t were imported from the "French West Indies" in 1980.

The SAPA company exports five percent of its total production to Miami. SAPA produces smoked swordfish, but it is not known if swordfish is included as "miscellaneous marine fish" in these exports. SAPA handles a 120 tons of fresh and frozen fish a month, or 1,440 tons annually; five percent of this would amount to 72 t (which is more than the 51 t exported in 1996). This suggests that nearly all exports of seafood from Guadeloupe is the work of one company.

XIII. Government Policy

The Martinique agency responsible for fisheries is the Direction Departementale des Affairs Maritimes de la Guadeloupe, which is part of the Secretariat d'Etat a la Mer, Prefecture de la Guadeloupe of the Republic of France. The Department operates from offices in Pointe-a-Pitre. Guadeloupe is a part of the French Republic and thus local authorities follow instructions received from France. Since France is also a member of the European Union (EU, formerly the European Economic Community or EEC), some policies are derived from EU regulations which apply to all French territories.

A. Fisheries law

Guadeloupe is a part of the French Republic and thus local authorities follow laws issued both by the National Assembly in France as well as instructions issue by the EEC which has since evolved into the EU. In the field of international law, EEC or EU regulations take precedence over national legislation.

B. Limits

France claimed a 12-mile Territorial Sea on December 24, 1971. The French claim included Overseas Departments like Martinique. France subsequently declared a 200-mile EEZ on July 16, 1976, which was enacted as Decree of March 6, 1978 for Martinique France signed the Law of the Sea Convention in 1982 with declarations. Marine boundary agreements have been negotiated by the EEC and Dominica (July 6, 1993)[63] and Venezuela (January 28, 1983).

C. License

Commercial fishermen are required to register their vessels and obtain a fishing permit. The Röle tax fee is $1,450 (10,000 Francs) and is valid for 2 years. The commercial fishermen also have to obtain a vessel inspection from the Affaire Maritime.[64] There is no recreational fishing license. The fishermen are only required to have a boat-operator license.[65]

XIV. Research

The French marine science institute known as I.S.T.P.M. has operated on the island of Martinique since May 1974. As of August 1979, it had not undertaken any significant activities in Guadeloupe.[66] In January 1976, a research center was established in Guyana that was designed to coordinate research with Laboratories in Cayenne and Robert and to work with scientists in Martinique and in Guadeloupe. In the late 1980's IFREMER, the Universite des Antilles et de la Guyane (U.A.G.) and the Institute Francaise de Recherche Scientifique pour le Developpement en Cooperation (ORSTOM) began working on Guadeloupe. Between October 1995 and October 1997, IFREMER conducted an experimental fishing survey using a 2.5 km. longline. The researchers caught only small (average weight was 2.5 km) male swordfish.[67] IFREMER has worked with FADs in the Caribbean, primarily around the two French islands of Guadeloupe and Martinique. They have also been interested in the work done off Curaçao.[68] They plan to work with Curaçao researchers to refine the effort calculating drag on FADs.[69]

In addition, scientific research has been conducted in association with the Commission for Fisheries of the Western Central Atlantic of the Food and Agriculture Organization (FAO) of the United Nations and the Association for the Caribbean Sea (IOCARIBE) as well as the Intergovernmental Oceanographic Commission (IOC).[70]

XV. Bycatch

The oceanic pelagic fishermen report a catch of marlin which is not exactly a bycatch as it is an important target species. One 1988 report suggested that the marlin (mostly white marlin) catch was about 25 percent of the oceanic pelagic catch.

Four species of sea turtles are reportedly found off Guadeloupe: leatherbacks, hawksbills, greens, and loggerheads. The first species to be protected were the leatherbacks.[71] Now all four species are protected.

Guadeloupe has no swordfish fishery and there is thus no resulting bycatch. No information is available on the bycatch experienced by the French longline project attempted in the early 1990s. There appaers to be a very small incidental swordfish catch from the island's artisanal fishery, but the authors have no details.

Available information suggests that nine species of seabirds nest on Guadeloupe and associated cays. Part of St. Martin is administered by the French as part of Guadeloupe and about eleven species nest there, although we do not precisely which species nest on the French side. St. Barthélemy is another French island administered as part of Guadeloupe and about nine species nest there (appendix C).[72] The species involved on each island are similar, but not identical. The authors have no information on fishery interactions with seabirds.

Some idea of potential Caribbean bycatch trends are available by assessing the data reported by the U.S. longline fleet in its Caribbean operations (Puerto Rico, appendices G1a-b). While this data does not pertain specifically to Guadeloupe's waters or fishing strategies used by Guadeloupe's fishermen, it does provide potentially useful benchmark data.[73]

XVI. International

A. International relations

1. Multilateral relations

Guadeloupe is part of Metropolitan France and, as such, is bound by French commitments to international organizations. France is a member of the International Commission for the Conservation of Atlantic Tunas (ICCAT).[74] French fishermen, including Guadeloupe fishermen, are obliged to respect the management rules and regimes established to protect tuna, swordfish, marlin, and other billfish in the Atlantic Ocean. In practical terms, this means very little to Guadeloupe since swordfish is rarely taken by local fishermen. France rarely raises issues concerning its overseas departments at ICCAT sessions, but has obtained a 4 t bluefin quota for St. Piérre et Miquelon, two small islands off Canada.

2. Bilateral relations

Although Guadeloupe is completely French, and Mainland companies could conduct swordfish operations, such fishing has not taken place. The authors found this interesting given the fact that the French fish extensively in much more distant locations in the Indian (La Réunion) and Pacific Oceans (French Caledonia).[75] The French can not exceed the very restrictive ICCAT north Atlantic catch allocation. Thus if fishermen were allowed to fish from Martinique, fishermen from mainland France would have to reduce their catch. French sources report that the small size of the Martinique EEZ, restricted by the EEZs of neighboring islands, is one factor. Marc Taquet, an IFREMER scientist reports that the reasons no Mainland French companies fish for swordfish in Guadeloupe or Martinique is because of the great pressure on Atlantic swordfish stocks and because French fishery managers do not want to encourage fishing for swordfish, except for the occasional catch by the small, artisanal fleet.[76] Perhaps the lack of infrastructure and high cost of imported fuel, spare parts, etc. also makes Guadeloupe less attractive to mainland French fishermen.

Available information on relations with other countries and neighboring islands is as follows.
Antigua-Barbuda: The Governments of Antigua and Barbuda and French authorities on Guadeloupe agreed to cooperate in fisheries during meetings held on March 30, 1982. In addition to research efforts into the

problem of poisonous algae off the coast of Antigua and Barbuda, the officials also looked at methods to establish management systems that would benefit fishermen of both countries. Conservation measures on fishing for spiny lobsters were announced, including size restrictions and prohibitions on the taking of roe-bearing females. Conditions outlining fishing inside Antigua and Barbuda's waters were discussed.[77]

Dominica: The European Union representing France and signed a reciprocal fishing agreement in 1993 for artisanal fishermen. The agreement renewed an agreement previously signed in 1987. The agreement involved reciprocal rights for both Guadeloupe and Martinique fishermen. The EU agreed to ECU 1.65 in financial compensation and to support a fisheries science program on Dominica. Dominica agreed to issue 200 fishing vessels from Guadeloupe and Martinique for various time frames, primarily for demersal species. The EU agreed to issue 20 licenses to Dominican fishermen.[78]

Japan: Japan has deployed the largest longline fleet in the Atlantic. The Japanese reported catches off Anguilla and the other Caribbean islands in the northeastern Caribbean as early as 1961 (Anguilla, appendix D). The Japanese, however, have not been active off Guadeloupe in recent years. For a detailed discussion of Japanese operations in the northeastern Caribbean see Anguillian chapter of this report.

Korea: Korea also deployed a major Atlantic longline fleet. Operations off Guadeloupe have never been extensive, but the Koreans did take 8.1 t of swordfish in the northeastern Caribbean during 1978. No catches have been reported since 1986 (Anguilla, appendix D).

Spain: Spanish fishermen in the Atlantic do not fish as far west as the Caribbean.

Taiwan: Taiwan, like the Japanese, initiated Caribbean-area longline operations in the 1960s. The primary Taiwan activity has been to the north of the Caribbean, as far as Bermuda, where they have targeted albacore to supply Puerto Rican canneries packing "white meat" tuna. Taiwan continues to be active in the northeastern Caribbean (Anguilla, appendix D). Many Taiwan longliners operate out of a Japanese-owned transhipment point on the Dutch side of St. Martin. Details on Taiwan fishing operations in the northeastern Caribbean are available in the Anguilla chapter of this report.

United States: U.S.-flag swordfish longliners operate in the Caribbean Sea to the east of Guadeloupe, but most fishing takes place well out to sea in the Atlantic Ocean.[79] U.S. vessels are not known to operate from, nor land their catches in Guadeloupe's ports.

B. Joint ventures

The authors are not aware of any joint venture fishing operations involving fishermen from Guadeloupe.

XVII. Enforcement

Enforcement of fishery regulations is the responsibility of the French Government, and enforcement is in the hands of the French Gendarmerie, Coast Guard, or Navy. Incidents are rare. Guadeloupe fishermen rarely report seeing fishermen from neighboring islands.[80] This is interesting because fishermen on the neighboring islands report seeing large numbers of Guadeloupe fishermen.

XVIII. Future Trends

Fishing for swordfish does not appear likely for the vast majority of fishermen in Guadeloupe. Since l'Armement Viking apparently never established a base of operations in the Caribbean Sea, it is unlikely that other French companies would seek to establish swordfish fisheries to the Caribbean Sea and western Atlantic Ocean.

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Appendices

Series A: Catch
Series B: Trade
Series C: Seabirds

Appendix A.--Guadeloupe. Fisheries catch, 1980-96

Year	Catch
	Metric tons
1980	8,000F
1981	8,300F
1982	8,240
1983	8,826
1984	8,940
1985	8,390
1986	8,500
1987	8,566
1988	8,191
1989	8,500
1990	8,600
1991	8,500
1992	8,500
1993	8,600
1994	8,800
1995	9,500
1996	9,570
1997	10,450
1998	9,114
1999	9,150F

F - FAO estimate
Source: FAO, *Yearbook of Fishery Statistics*, (FAO: Rome, various years).

Appendix B1.--Guadeloupe. Swordfish exports by destination, 1991-95

Destination	Year									
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
	Metric tons									
United States	-	-	-	-	-	-	-	-	-	-
Japan	-	-	-	-	-	-	-	-		
European Union	NA	-	-	-	-	-	-	-		
Others**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total	NA	-	-	-	-	-	-	-		

** Swordfish shipments to other countries are believed to be non-existent or negligible
Source: Various

Appendix B2a1.--United States. Swordfish imports from the French West Indies*, 1975-88

Year	Commodity		Total
	Fresh	Frozen	
	Metric tons		
1975	-	-	-
1976	-	-	-
1977	-	-	-
1978	-	-	-
1979	-	-	-
1980	-	-	-
1981	-	9.1	9.1
1982	-	-	-
1983	-	-	-
1984	-	-	-
1985	-	-	-
1986	-	-	-
1987	-	-	-
1988**	-	-	-

* Term used in U.S. Customs statistics, combining Guadeloupe and Martinique
** Beginning in 1989, imports from Guadeloupe and Martinique were listed separately under each island.
Source: U.S. Bureau of the Census

Appendix B2a2.--United States. Swordfish imports from Guadeloupe, 1989-2000

Year	Commodity		Total
	Fresh	Frozen	
	Metric tons		
1989	-	-	-
1990	-	-	-
1991	-	-	-
1992	-	-	-
1993	-	-	-
1994	-	-	-
1995	-	-	-
1996	-	-	-
1997	-	-	-
1998	-	-	-
1999	-	-	-
2000	-	-	-

Source: U.S. Bureau of the Census

Appendix B2b1.--United States. Swordfish imports from the French West Indies*, 1975-88

Year	Commodity		Total**
	Fresh	Frozen	
	US$1,000		
1975	-	-	-
1976	-	-	-
1977	-	-	-
1978	-	-	-
1979	-	-	-
1980	-	-	-
1981	-	28	28
1982	-	-	-
1983	-	-	-
1984	-	-	-
1985	-	-	-
1986	-	-	-
1987	-	-	-
1988**	-	-	-

* Term used in U.S. Customs statistics, combining Guadeloupe and Martinique
** Beginning in 1989, imports from Guadeloupe and Martinique were listed separately under each island.
Source: U.S. Bureau of the Census

Appendix B2b1.--United States. Swordfish imports from Guadeloupe, 1989-2000

Year	Commodity		Total
	Fresh	Frozen	
		US$1,000	
1989	-	-	-
1990	-	-	-
1991	-	-	-
1992	-	-	-
1993	-	-	-
1994	-	-	-
1995	-	-	-
1996	-	-	-
1997	-	-	-
1998	-	-	-
1999	-	-	-
2000	-	-	-

Source: U.S. Bureau of the Census

Appendix C.--Guadeloupe and associated islands. Seabird nesting, 1984

Area	Information	Species*	Known** threats	Importance***
Guadeloupe#	Reasonable	3, 5-6, 10, 12, 16, 18, 19, 22	Ex?, Ha, ?	Important
St. Barthélemy#	Poor	3, 5, 10?, 12?, 13, 16, 18-19?, 20	?, Ex?	Important?
St. Martin##	Good	3, 5-6, 11-13?, 16, 18-19?, 20, 22	Ex, Ha, Pr?	Important

* Species: 3 - Puffinus I. lherminieri; 5 - Phaethon aethereus; 6 - P. lepturus; 10 - Sula leucogaster; 11 - Pelecanus occidentalis; 12 - Larus atricilla; 13 - Sterna maxima; 16 - S. dougallii; 18 -S. anaethetus; 19 - S. fuscata; 20 - S. (albifrons) antillarum; 22 - A. stolidus
** Threats: Ex - exploitation of eggs, young or adults; Pr - predators, generally introduced mammals; Ha - habitat destruction or disturbances; Po - pollution; Fi - fisheries
*** A rough subjective rating of relative importance of area for breeding seabirds.
# And offshore cays
Part of the island is under Dutch jurisdiction.
Source: Ruud van Halewyn and Robert L. Norton, "The status and conservation of seabirds in the Caribbean," in J.P. Croxall, P.G.H. Evans, and R.W. Schreiber (eds.), "Status and conservation of the world's seabirds," *ICBP Technical Publication*, No. 2 (ICBP: Cambridge, 1984), pp. 175-176.

13

HAITI

by William B. Folsom

Haiti occupies a third of the island of Hispaniola located in the Northern Caribbean Sea between Cuba and Puerto Rico. The remainder of the island is the Dominican Republic. Haiti has the unenviable record of being one of the poorest, and until recently, the most chaotic country, in the world. Haiti's fishing industry is artisanal and is barely able to produce sufficient seafood to feed 30 percent of the population; about seventy percent of Haiti's seafood needs must be imported. Fishing is limited to a few species of reef fish, spiny lobster, and conch. Fishing areas within reach of the antiquated fishing fleet have been heavily fished and are badly depleted. Artisanal fishermen do not have vessels capable of targeting large pelagic, highly migratory species. As a result, swordfish is not caught in Haiti although United States vessels landed swordfish in Haiti between 1988 and 1989 and currently report catches in the Windward Passage between Haiti and Cuba. There is little likelihood that Haiti will develop a pelagic fishery in the foreseeable future.

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Figure 1.--Map of Haiti.

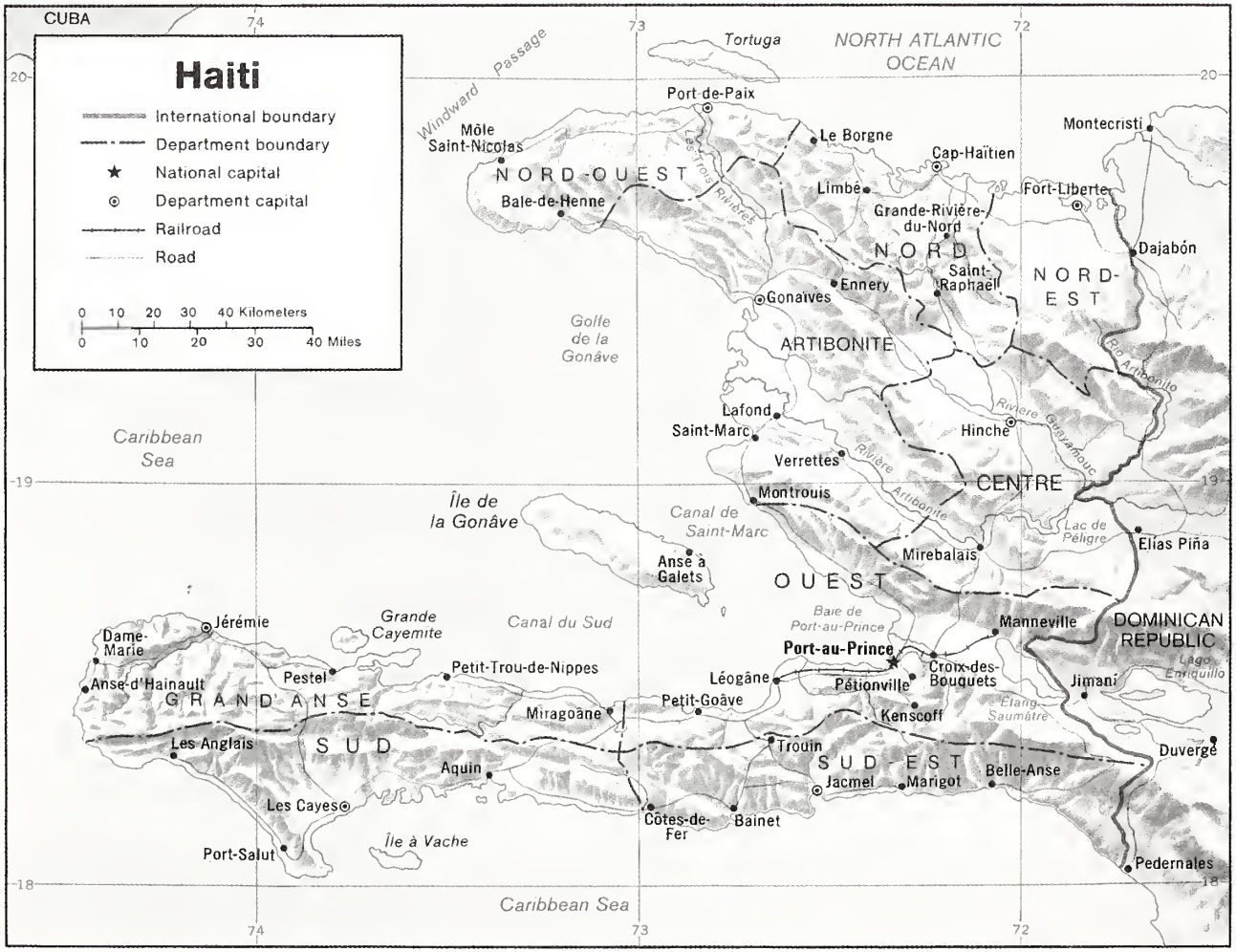

Figure 1.--Map of Haiti.

I. Overview

A. History[1]

The island of Hispaniola was discovered by Christopher Columbus during his maiden voyage of discovery to the new world in 1492. Spanish explorers used the island as a base to explore the Western Hemisphere. French buccaneers used the western part of the island, what was later to become Haiti, to harass English and Spanish shipping. In 1697, Spain ceded the western third of the island to France. Gradually French settlers moved to Haiti and began operating sugar plantations with imported slave labor. The island soon became one of the richest French colonies of the 18th Century. In 1791, African slaves revolted, and after defeating Napoleon Bonaparte's army, declared independence in 1804. Haiti is the world's oldest black republic and the second oldest republic in the Western hemisphere, after the United States. The people of Haiti conducted virtually the only successful slave rebellion in all history.

B. Fishing industry

Haiti is one of the poorest countries in the World. Limited natural resources, bad agricultural practices, deforestation, generations of corruption and political instability, a surging population, minimal infrastructure, and poor education, have all impacted negatively on the island.

Haiti fisheries produces very little fish. Most stocks have been overfished for generations. Once productive coral reefs have been stripped of coral for sale to overseas markets. Deforestation has resulted in massive erosion with silt-laden waters flowing out to the sea. Eighty percent of Haiti's energy consumption comes from charcoal; production of charcoal has resulted in indiscriminate cutting of trees at such a rate that it has produced an ecological disaster for the nation.[2]

Haiti does still have, however, some mangrove estuaries that serve as important nurseries for juvenile fish and especially shrimp.[3] Haiti's fleet of small artisanal fishing canoes has restricted fishermen to the limited number of inshore grounds--which are badly depleted. Few larger boats exist and the few that do are mostly employed in the lucrative, but often fatal, trade of carrying illegal immigrants to the United States.

There are approximately 3,000 full-time and 7,000 part-time fishermen employed in Haitian fisheries.[4] These fishermen produced about 6,000 tons of fish in 1996.[5] This was insufficient to meet the demands of the population and imports of 6,500 tons were required.[6]

Haiti's fisheries are based on demersal species such as snappers, caught close to shore by subsistence fishermen using primitive fishing craft and gear. Sometimes schools of jacks or a small barracuda can be seen. One report indicates that logistical and economic constraints have limited the development of offshore pelagic resources.[7] Spiny lobsters are harvested in traps made of woven palm fronds and queen conchs are simply harvested by hand; both species are heavily fished.[8] Spearguns are sometimes used. Sea turtles are also harvested in Haiti and both the meat and eggs of sea turtles are considered a delicacy. Sea turtles are harvested using a special trap composed of a wooden cross wrapped with used netting.[9]

Haitian fisheries are characterized as mostly subsistence fishing for local consumption by fishermen and their families. Some products are purchased from fishermen and then taken to nearby villages or towns for sale in open air markets. Most conch and spiny lobsters are flown to Miami and New York where there are large communities of Haitian expatriates. Total Haitian exports amounted to $1.2 million in 1996.[10]

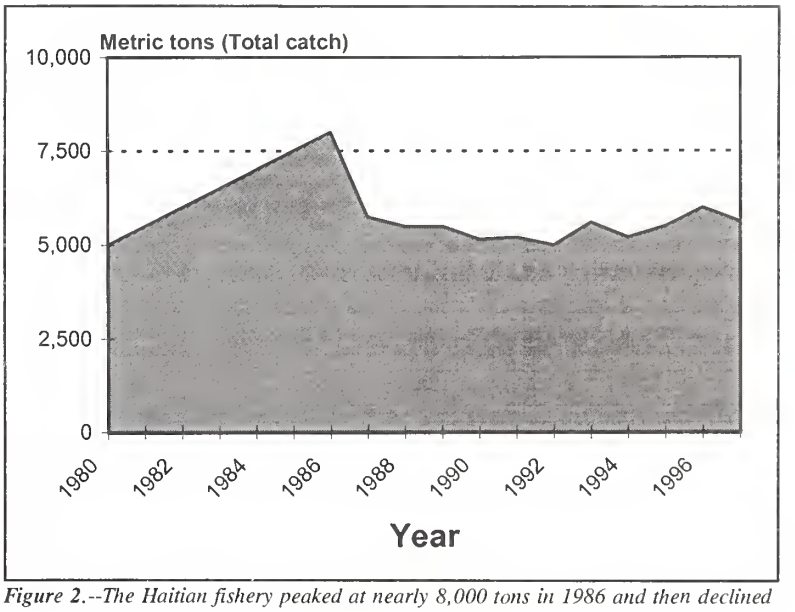

Figure 2.--The Haitian fishery peaked at nearly 8,000 tons in 1986 and then declined to about 5,000 tons and has changed little in recent years.

C. Geography

The Republic of Haiti comprises the western third of the island of the Island of Hispaniola, one of the islands of the Central Antilles, while The Dominican Republic occupies the eastern portion of the island. Hispaniola is situated in the northern portion of the Caribbean Sea between Puerto Rico and Cuba.

Haiti consists of a land area of about 27,750 square kilometers (km), which is about the size of Maryland. Port-au-Prince is the capital of Haiti and Cap Haïtien is the second largest city. Most of the country is mountainous and unsuitable for farming. The countryside is now scarred by widespread deforestation and erosion.

II. Species

A. General

There is evidence of pelagic resources of tuna, sharks, billfish, shark, flying fish, squid, and other species off the coast of Haiti.[11] Unfortunately, these offshore pelagic fish are simply beyond the reach and fishing capabilities of Haiti's fleet of wooden canoes and fishing boats.[12]

It is believed that offshore pelagic species could generate yields of up to 6,000 tons annually. However, these species of tuna, bonito, and mackerel are simply beyond the reach of Haiti's artisanal fishermen. In addition, some inshore pelagic species, such as sardines, anchovy, and herring, could be caught in greater quantities if Haitian fishermen had more efficient gear and were trained in more effective fishing methods.[13]

B. Swordfish

The southern Caribbean is considered to be an important nursery area for juvenile swordfish.[14] Relatively little spawning of swordfish occurs within the Caribbean itself. Considerable spawning activity is reported off western Cuba, both in the Yucatan and Florida Straits.[15] There is also some spawning around the Lesser Antilles, primarily from north of Anguilla to Saint Lucia. The larvae found in the Lesser Antilles are both small and large-sized. The lesser numbers of small larvae suggest that spawning is less intense than in the western Caribbean off Cuba. The numbers of large larvae suggest that larvae are retained there or recruited from adjacent regions.[16] A 1998 analysis shows a similar pattern of larval concentrations in the Gulf of Mexico and the southeastern coast of the United States, but more limited concentrations off the northern islands in the Lesser Antilles.[17]

Tag return data on swordfish is limited. Three tags have been recovered in the Windward passage between Haiti and Cuba from fish tagged off the U.S. mid-Atlantic and New England coast (Caribbean Overview, figure ? and appendix C3). What is not clear is the route that the fish took from the northeast coast to the Windward Passage. One possibility is that the fish followed the circuit of the north Atlantic Subtropical Gyre and were re-entering the Caribbean through the Windward Passage. Another is that they followed the Gulf Stream south. Interestingly, one

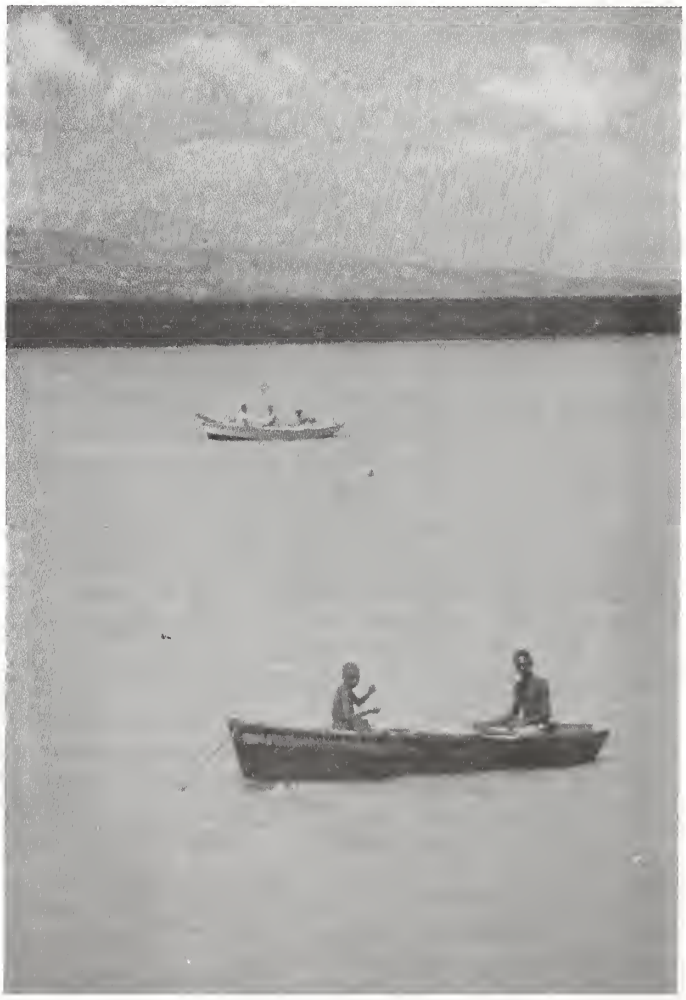

Photo 1.--Deforestation has resulted in massive erosion with silt-laden waters flowing into the sea. William B. Folsom

swordfish was tagged (R279963) in the Atlantic northeast of the Leeward Islands during 1993. The fish was retrieved 1 year and 5 months later in the Windward passage (figure 3). It was a juvenile of 13.6 kg that had more than doubled in weight. Perhaps the fish had made the full circuit of the Subtropical Gyre. There is no way of telling with the existing tag data. The fact that the fish was caught after 1 year and 5 months suggest that not all swordfish may make annual migrations. There are, however, several other alternative explanations.[18]

III. Grounds

Haiti has a coastline of about 1,535 km and a Continental Shelf area of 5,000 sq. km. This is significant when compared to Haiti's 15,000 sq. km. arable landmass.[19] Haiti is surrounded by the west and south by the Caribbean Sea and by the North Atlantic Ocean to the north. The windward passage separates Haiti from Cuba. The large Golfe de la Gonâve is divided into the Canal de Saint-Marc to the north of the Île de la Gonâve and the Canal du Sud to the south of the island. The Continental Shelf is very narrow along both the northern and southern coast, but there is an extensive area of shallow water to the west in the Golfe de la Gonâve.

A history of overfishing and the destruction of coral reefs for sale to overseas markets have resulted in a serious deterioration of the size and composition of Haiti's fisheries resources. There are fewer, and smaller, fish and shellfish available to local fishermen.[20] In those areas where coral reefs remain healthy, few fish are found, and those that are seen are usually small. This is the result of the unrestricted production and deployment of "Z-traps" that catch fish so tiny that they never have a chance to reproduce.[21] This intense pressure on fish stocks negatively impacts recruitment.[22]

Fishing usually takes place within 5 km of shore by fishermen using wooden canoes or boats.[23] Usually one or two fishermen operate from a canoe, sometimes a father and son team.[24] The Continental Shelf extends less than a few kilometers offshore before dropping to depths of 300 to 1,000 meters, far beyond the capacity of Haitian fishermen to deploy their limited fishing gear. The absence of upwelling off Haiti's coastline further limits phytoplankton production. This compounds the problem caused by overfishing, including immature juveniles.[25]

There are five areas where the Continental Shelf extends out, permitting fishing operations. These areas include:

(1) The waters between Île de la Gonâve and Port-au-Prince,
(2) West of Jérémie, between Dame-Marie and Les Irois,
(3) South of Les Cayes,
(4) North of Cap Haïtien, and
(5) The bay at Grande Saline.

While Haitian fishermen do not target swordfish, United States fishermen report that the species is available in Haitian waters. The location of the U.S. fishing fleet's operations varies, from year to year, but effort is often reported in the Windward Passage between Cuba and Haiti as well as other locations.[26]

IV. Fleet

The Haitian fishing fleet consists of between 3,000 and 3,500 small wooden craft. Approximately 2,000 of these are dug-out canoes of between 3 meters (m) to 4.5 m in length. There were about 1,000 small wooden sailboats operating in Haiti in the 1980s. Most are operated by oars or by small sails. Haiti has the least motorized artisanal fleet in the Caribbean. There were about 60 wooden boats in the 4 m to 6 m length and six vessels in the 12 m to 14 m length with motors in 1987-88.[27] The author knows of no commercial longliners.

V. Shipyards

Most of Haiti's fleet consists of wooden canoes or small wooden sailboats. They are built along isolated beaches, in small fishing communities, or at small shipyards near a large community. Many are fairly rudimentary. Basic woodworking is needed to produce or fix problems with most canoes or sailboats.[28] Haiti has neither shipyards capable of building or maintaining commercial longliners.

VI. Fleet Operations and Gear

A. Fleet operations

Fishing generally takes place throughout the year. A single daily trip of several hours yields an artisanal harvest of 5 kg to 10 kg and this is enough to keep a family fed and earn a tiny income.[29] There are no known artisanal or commercial longliner operations.

Photo 2.--A Haitian canoe fisherman poles in shallow depths. Haiti is one of the few Caribbean islands where many artisanal fishermen do not have outboards. William B. Folsom

B. Gear

Artisanal fishing gear consists of hook-and-line, palm-woven fish traps "Z-traps", beach seines, trammel nets, spear guns, spiny lobster traps made of wood, as well as harvesting by hand.[30] Shrimp are caught using beach seines in the Gulf of Île de la Gonâve, Grande Saline, and Les Cayes, between Aquin and Ile-a-Vache. Shrimping takes place throughout the year. One or two beach seines are used to harvest shrimp.[31] The author knows of no longline gear deployed by Haitian fishermen.

VII. Catch

Haiti does not have a well developed statistical reporting system. Data on specific species are not available and the annual catch data are rough estimates made by Haitian officials based on little real data from the artisanal fishermen.

1960 to 1989: Haitian fishermen slowly increased their catch of fish and shellfish from 2,600 t to a high of 8,050 tons. The greatest increased took place in 1969 when the harvest increased from 2,600 t to 4,753 tons. By 1989, however, the catch had fallen to only 5,500 tons.

1990 to 1996: Haitian fishermen caught between 5,000 t and 6,000 t of fish and shellfish annually. Approximately 3,500 to 4,000 t consisted of miscellaneous marine fish. Caribbean spiny lobster (*Panulirus argus*) harvests ranged from 800 t to 950 tons. Strombroid conch harvests amounted to 350 t to 400 tons. The catch of inshore shrimp ranged between 100 t and 150 tons. There was also a harvest of freshwater fish that ranged between 400 t and 600 t during the years 1991-96.[32]

There are no reports of Haitian fishermen catching swordfish during these, or previous years, in any of the literature available for this report.

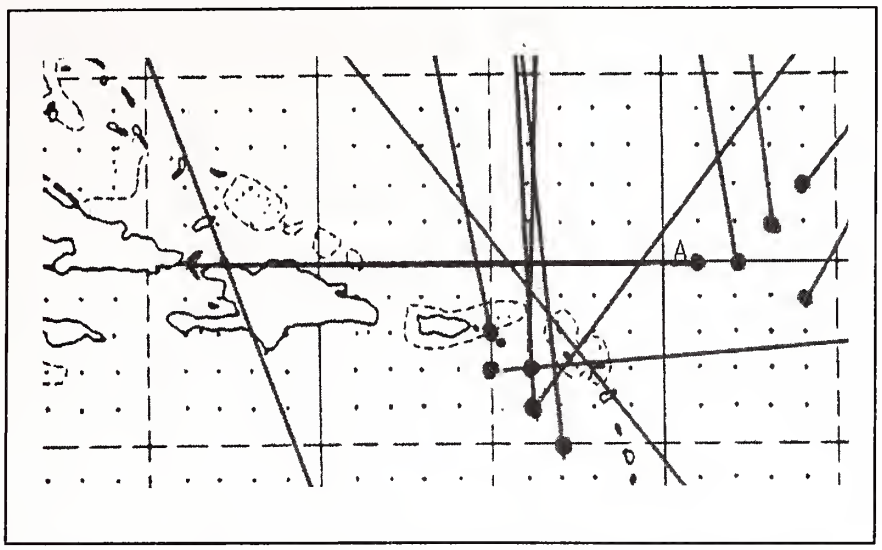

Figure 3.--One swordfish was tagged (R279963) northeast of the Leeward Islands and then retrieved 1 year and 5 months later in the Windward Passage between Cuba and Haiti.

United States.[36] A Jamaican report suggests that U.S. longliners transhipping through Kingston in the mid-1980s shifted to Port au Prince.[37] The author has no details on why such landings were made in 1988 and terminated after 1989. The chaotic conditions in Haiti and the lack of basic infrastructure did not encourage foreign fishermen to use Haitian port facilities. Thus, the U.S. 1988-89 swordfish shipments are the only known transshipments through Haiti.

VIII. Ports

Fishing in Haiti is conducted from many small landing sites scattered along the length of the 1,700 km Haitian coastline. Frequently only one or two canoes operate from a particular site and the catch is generally used for subsistence to feed family members or are bartered in the coastal communities with farmers for yams, sugar cane, coconuts, mangos, or other vegetables, fruits, a chicken or a piece of meat.[33]

Small concentrations of fishermen operate from Anse d'Hainault, Île de la Gonâve, Les Cayenites, Les Cayes, Miragoane, Môle Saint-Nicolas, and Montrouis.[34] There are many other towns where individual fishermen can sell their catch to local populations, including Aquin, Cap Haïtien, Cotes-de-Far, Genovese, Jacmel, Jeremie, Leogane, Port-au-Prince, Port-Salut, and others.[35]

IX. Transshipments

The Southeast Fisheries Science Center of the National Marine Fisheries Service reported that U.S.-flag fishing vessels landed 126.8 t of swordfish (trunk weight) in Haiti in 1988. An additional 69 t was landed in 1989 (appendix A2). No further landings were reported. These landings were transhipped to the

X. Processing and Products

Haiti neither catches nor processes swordfish products.

XI. Companies

There are no Haitian companies that catch, land, produce, tranship, nor export swordfish. However, in 1988-89, some swordfish was landed in a Haitian port by a US-flag fishing vessel(s). That swordfish was presumably transhipped to the United States in cooperation with a freight forwarder. The freight forwarder may have had to have access to cold stores or chill rooms able to hold the product until shipment could be arranged to the United States, either by air or by sea. The swordfish was fresh product. Although sea and land service is available from some of the regional capitals, it is most likely that these facilities were in the capital city of Port-au-Prince, Haiti. No information about this transaction could be found in NMFS files used to prepare this report.

XII. Markets

There is a large demand for seafood in Haiti. Harvests typically account for only one-third of all seafood consumed in the country; two-thirds of all edible fish protein must be imported. In 1988, for example, the harvest was 8,050 t while imports amounted to 17,675 for a total of 25,725 tons. Exports were 183 t leaving 25,52 t available for a population of 6.3 million people. This gave each Haitian 4.1 kg of fish protein per year to consume.

A. Domestic

Fish are usually sold individually or by the piece directly from the bottom of a canoe that has just returned from fishing. Some fish is bought by merchants who transport the fish to larger markets in Port-au-Prince or other towns or cities where it is sold fresh, dried, or salted, usually in open air markets. A few small stores catering to European or American citizens sell fresh fish in refrigerated display cases. Frozen fish is sometimes available.[38]

B. Trade

1. Exports

Haiti exported 57 t of crustaceans and mollusks worth $0.9 million in 1996 and $0.4 million worth of fresh or frozen fish. Almost all of the harvest of spiny lobsters is exported as frozen tails to the United State and other Caribbean islands. Conch meal, small quantities of shrimp, and some reef fish are also exported. Haiti exported $11 million in 1997.[39] There are no known shipments of swordfish (appendix B).[40]

2. Imports

Haiti must import fish to meet the demand for fish protein. Most imports consist of dried, salted, and canned fish from Canada, Europe, and Japan. In 1996, these imports amounted to 6,500 tons valued at $4 million. Fresh, chilled or frozen fish imports were 2,375 t worth $0.9 million, dried, salted or smoked fish amounted to 4,060 t worth $3 million. Small quantities of canned fish, oils, and fishmeal were also reported.[41] Haiti imported $6.7 million in 1997.[42]

XIII. Government Policy

The Ministry of Agriculture, Natural Resources and Rural Development is the agency concerned with implementation of Haiti's fisheries policies.[43]

A. Fisheries law

Haitian fishing law is based on a series of laws. The most important of these laws include:

Articles 22, 90, 92, and 93 of the Constitution.

The Law reorganizing the Department of Agriculture, Natural Resource and Rural Development of March 17, 1958;

The Law creating the Fishery Service of August 20, 1959;

The Executive Decree of February 12, 1961 regulating Fishing in Sea-water;

Articles 212-215, 372, 378-79 of the Francois Duvalier Rural Code dated May 24, 1962

Decree No. 38, April 4, 1977

Degree delimiting Haiti's territorial sea in the riparian zone and its exclusive economic zone of April 8, 1977

The Legislative Chamber Decree dated September 19, 1978, and lastly

Decree signed by Jean-Claude Duvalier, President for Life of the Republic at the National Palace in Port-au-Prince on October 27, 1978.[44]

These laws provide the framework for the protection for freshwater, coastal, and marine fishery resources and define and codify Haiti's fisheries and regulations. However, enforcement has eroded over the years and is currently almost non-existent because of lack of resources for patrolling and enforcing laws.[45]

B. Permits

In at least one incident, in 1988, a U.S. shrimper was found fishing inside Haitian waters. The vessel's captain was escorted to Port-au-Prince, for the purpose of registration. However, after learning of the

registration requirements, the vessel left without registering. The incident took place around June 20, 1988.[46]

C. Limits

Haiti declared a 12 mile territorial sea and a 200-mile Exclusive Economic Zone (EEZ) on April 8, 1977.[47] Haiti signed marine boundary agreements with Cuba (1978) and Colombia (1979). Shortly after the signing of the accord with Cuba, it was announced that Haiti would negotiate similar boundary agreements with the Dominican Republic, Jamaica, and the Bahamas.[48] Haiti signed the Law of the Sea Treaty in 1982.

XIV. Research

There are few fishery scientists in Haiti.[49] Research is sometimes conducted by international bodies, such as the Food and Agriculture Organization (FAO) of the United Nations (UN) and by friendly nations interested in supporting Haitian development. In 1991, for example, the National Oceanic and Atmospheric (NOAA) Research Vessel *Malcolm Baldridge* was allowed to conduct a research cruise in Haitian waters between January 7 and February 1, 1991.[50] The authors know of no Haitian research activities on swordfish or other large oceanic highly migratory species.

The United States, Mexico, and Cuba have been cooperating in coastal shark assessments. While Haiti is not participating in this assessment, work done off eastern Cuba and Navassa Island as they are close to Haiti, may provide insights into shark and other marine stocks. Off Cuba there was no predominate shark species in the demersal sets, but several duskys and silkys were taken in the pelagic sets. Two swordfish were also taken off western Cuba. Off Navassa the dominate shark was the scalloped hammerhead.[51]

XV. Bycatch

Haitian fishermen employ gear and fishing methods that catch very specific species: reef fish, conch, shrimp, spiny lobster, and a few other species. Practically anything that is caught is kept. There is very little bycatch, in the sense of discarded species, in Haiti's fisheries. The harvest of undersized fish, in particular, is a concern to fishery managers since this removes fish from the ecosystem before they have a chance to replenish their stocks. The cooperative shark research conducted by the United States, Mexico, and Cuba may provide some insights into shark species off Haiti as work was conducted off western Cuba and Navassa Island.[52]

Even endangered sea turtles are believed to be commonly retained by artisanal fishermen if taken. Both meat and eggs are consumed in Haiti. One 1990 report indicated that they are "highly appreciated" by Haitians and could be obtained in Port-au-Prince seafood shops. No data exists on catch or consumption levels. Shells were used in local tourist shops and have been exported to Japan. Shipments of 2.8 t were reported in 1986. Haitians trapped turtles by using a special trap composed of a wooden cross wrapped with used nets.[53]

One study of Caribbean seabirds reported that while information was poor, 12 species were thought to nest on Haiti and offshore cays and islets (appendix C1).[54] Bird observations made off Navassa Island as part of the United Stats, Mexico, and Cuba cooperative

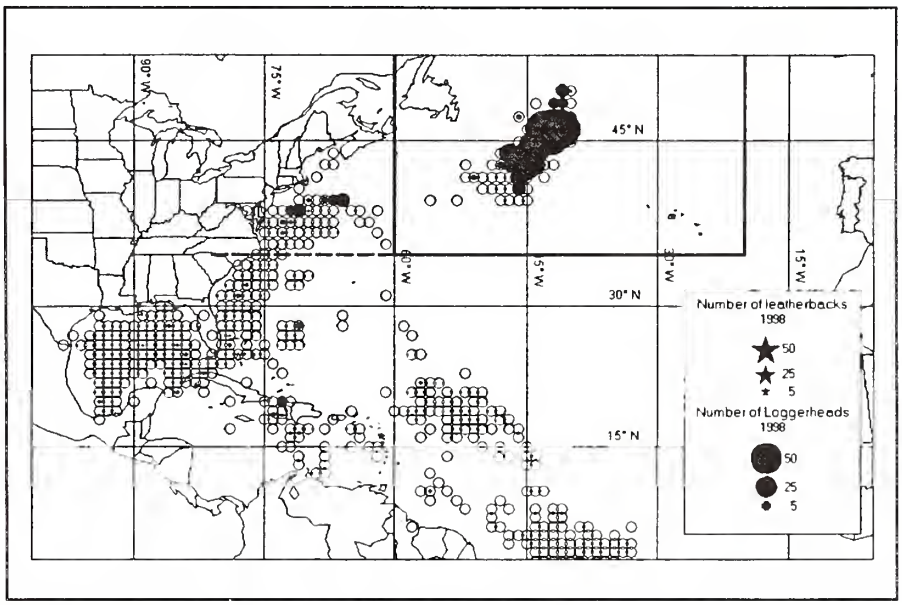

Figure 4.--U.S. longline fishermen in 1998 reported a few interactions with loggerheads in the Windward Passage between Cuba and Haiti. Brewster-Geisz

shark assessment in 1998 identified 8 different species. The most common were the Magnificent Frigatebird and the Brown Booby along with lesser numbers of the Red-footed Booby and the Cliff Swallow (appendix C2).[55] The authors know of no study assessing seabird interactions with the country's essentially artisanal fishing industry.

Haiti has no swordfish fishery and there is thus no resulting bycatch. Some idea of potential Caribbean bycatch trends are available by assessing the data reported by the U.S. longline fleet in its Caribbean operations (Puerto Rico, appendices G1a-b).[56] While this data does not pertain specifically to Haitian waters or fishing strategies used by Haitian fishermen, it does provide potentially useful benchmark data. U.S. fishermen have, for example, reported some loggerhead turtle interactions in the Windward Passage between Cuba and Haiti.[57]

XVI. International

A. International relations

1. Multilateral

Haiti because of the small size of its fishing industry participates in few international organizations working on fisheries. The Haitian Government has not ratified the U.N. Convention on the Law of the Seas (UNCLOS), the Cartagena Convention, or the Convention in Straddling Fish Stocks and Highly Migratory Fish Stocks.

CARICOM: Haiti is a member of CARICOM, but the authors have few details about its participation concerning fisheries. Haiti does not participate in CFRAMP, but does participate in the EU-financed biodiversity management program administered by the Caricom Fisheries Unit in Belize.[58]

ICCAT: Haiti not a member of ICCAT. The authors know of no Haitian collaboration with ICCAT programs.

2. Bilateral

Haiti has very limited international fishery relations, in part because of the small size of the country's fishing industry. Several foreign countries fish in Haitian waters which include areas of two ICCAT statistical squares.[59]

1570: This is the area west and south of Haiti. Much of ICCAT square 2065 falls within the EEZ of Haiti and the Dominican Republic. A smaller portion is in the Cuban EEZ. Foreign activity in this area will be discussed in this chapter below under each country (appendix A3).

2070: Haiti's northern coast includes a small area of the southern portion of ICCAT 2070. See the Turks and Caicos chapter of this report for fishing activity in this area.

Some information is available with Dominican fishery relations with individual countries.

Bahamas: Bahamian officials report fishery violations by Haitian artisanal fishermen. There are also numerous incidents with boats carrying migrants to the United States as they pass through Bahamian waters.

Cuba: Haiti and Cuba signed a maritime boundary accord in Havana on October 27, 1977. The accord delimited the maritime boundaries between the two countries based on 51 geodetic coordinates based on the principle of equidistance.[60] Four Cuban fishing boats carrying 37 technicians arrived in Port-au-Prince during early 2000. The Cubans joined others already in Haiti and plan to stay for about a year. The Cubans were participating in the Haitian Government's fisheries development program. The Cubans are involved in both capture fisheries and aquaculture. The Cubans are

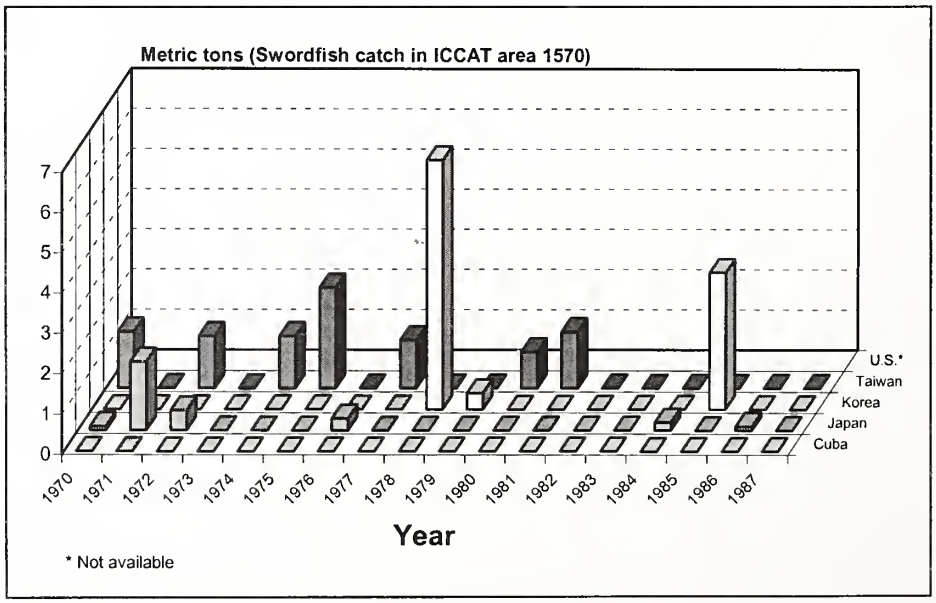

Figure 5.–The last Asian country to report longline operations in ICCAT area 1570 was Japan in 1986. There has been some fishing, but the U.S. data is unavailable.

reportedly contemplating the construction of 100 small fishing boats for the Haitian Government.[61] The Cuban have not deployed their commercial longliners in Haitian waters (appendix C3). The level of artisanal operations is unknown.

Dominican Republic: Presumably there are some fishery contacts with the neighboring Dominican Republic, the country occupying the eastern part of Hispaniola. The author, however, has been able to find little information.

Japan: Japanese longliners have been active in off Haiti in ICCAT square 1570, but primarily in the 1960s and early 1970s. After 1972 the Japanese only occasionally deployed longliners off Haiti. The last Japanese fishing occurred in 1986. Only minimal catches of swordfish were reported. The largest catch was taken in 1966 and totaled 3 t (appendix A3). Japanese operations were seasonal, being primarily concentrated in the third quarter.

Korea: Korea has reported only minor fishing operations in ICCAT square 1570. Fishing was only conducted in 1978-79 and 1985. The few years the Koreans fished off Haiti, they reported relatively good swordfish catches. A catch of 6.2 t was reported in 1978 (appendix A3). Operations were seasonal, like the Japanese, the Koreans fished primarily in the third quarter.

Suriname: The U.S. Embassy in Port-au-Prince reported that an agreement between Haiti and Suriname was negotiated which granted Haiti the rights to fish in Suriname's waters. No further information is available on this fishery.[62]

Taiwan: Taiwan fishermen operated in ICCAT square 1570 during the kate 1960s and 70s. The last Taiwan operations were reported in 1981. Taiwan swordfish bycatches tended to be higher than those reported by the Japanese. The Taiwan fishermen reported a substantial swordfish catch of 10.5 t in 1968 (appendix A3). Most of the Taiwan fishing was reported in the second half of the year.

Trinidad-and-Tobago: Press reports indicate an agreement similar to the one with Suriname was reached with Trinidad-and-Tobago.

United States: The United States has no fishery agreements with Haiti. The United States does, however, claim an uninhabited island known as Navassa Island, that has long been claimed by Haiti. The Government of Haiti requested negotiations on the status of Navassa in 1974.[63] United States longliners commonly fish for swordfish off the northwestern coast of Haiti. Although precise coordinates are not shown, this fishery appears to be centered in the Windward Passage between Haiti, Cuba, and Great Inagua Island. There is an indication that some fishing for swordfish may have taken place in the area off Île de la Tortue and possibly in the Canal du Sud off Jérémie. Fishing also appears to take place in the Beata Ridge and in the Colombian Basin area of the Caribbean Sea off the southern coast of Haiti and the Dominican Republic.[64]

B. Joint ventures

The authors know of no active fishery joint ventures in Haiti nor have there been any significant activities in recent years. In mid-1979, a joint venture fishing arrangement was reached with a Spanish company. The result was the establishment of La Societe de Peche Indusrielle d'Haiti (SPIDHA). Two Spanish fishing vessels fished in Haitian waters, but left to fish off Trinidad and Tobago and Surinam after a few months.[65]

XVII. Enforcement

Enforcement is almost non-existent because Haiti lacks vessels and officers to patrol and enforce laws.[66] Even if Haiti did have enforcement officers, the need for food is so great that enforcement officials could presumably be overwhelmed by the task of enforcing laws.[67]

XVIII. Future Trends

It is unlikely that Haiti will be a center for swordfish fishing, even though available data suggest that foreign fishermen are longlining in and around Haitian waters. Haitian fishermen simply do not have the vessels needed to fish offshore. Few fishermen are trained to fish more than a few kilometers offshore. Onshore cold stores exist in only a few communities and freighters or regular airline flights operate out of Port-au-Prince - far from fishing grounds where swordfish might be found.

It is possible that longliners operating in the northern Caribbean Sea might unload their catch in Haiti as was the case in 1988 and 1989. Since U.S. swordfish longliners still fish for swordfish in the waters around Haiti, it would seem possible that Haiti could be a transshipment site for small quantities of fish. However, there have been no further shipments through Haiti in the past decade and thus this option appears unlikely for the immediate future. It is more likely that U.S. longliners find it easier to use the better facilities in Puerto Rico or to return to south Floridan ports to land their catch.

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Appendices

Series A: Catch
Series B: Trade
Series C: Seabirds

Appendix A.--Haiti. Fisheries catch, 1980-96

Year	Catch
	Metric tons
1980	5,000F
1981	5,500F
1982	6,000F
1983	6,500F
1984	7,000F
1985	7,500F
1986	8,000F
1987	5,750F
1988	5,500F
1989	5,500F
1990	5,150F
1991	5,200F
1992	5,000F
1993	5,600F
1994	5,200F
1995	5,517F
1996	5,245F
1997	5,311F
1998	5,219F

F - FAO estimate
Source: FAO, *Yearbook of Fishery Statistics*, various years.

Appendix A2.--United States. Swordfish landings in Haiti, 1984-98

Year	Landings
	Metric tons*
1984	-
1985	-
1986	-
1987	-
1988	126.8
1989	69.0
1990	-
1991	-
1992	-
1993	-
1994	-
1995	-
1996	-
1997	-
1998	-

* Product, primarily trunk weight
Source: Southeast Fisheries Science Center, National Marine Fisheries Service.

Appendix A3.--Wider Caribbean. Foreign swordfish catches in ICCAT area 1570, by country and quarter, 1959-97

Country	Year	Quarter 1	2	3	4	Total
		Metric tons				
Cuba	No commercial operations*					
Japan	1960				0.4	0.4
	1962		0.7	0.1		0.8
	1963			5.1	3.0	8.1
	1964	0.2	0.1	0.4	0.2	0.9
	1965	0.2	0.1	0.1		0.4
	1966			1.5	1.5	3.0
	1968			0.1		0.1
	1970				0.1	0.1
	1971		0.1	0.3	1.3	1.7
	1972				0.5	0.5
	1976			0.3		0.3
	1984	0.1	0.1			0.2
	1986			0.1		0.1
Korea	1978			0.6	5.6	6.2
	1979			0.2	0.2	0.4
	1985			3.4		3.4
Spain	No fishing operations					
Taiwan	1968			0.5	10.0	10.5
	1969	0.2			2.2	2.4
	1970				1.4	1.4
	1972		1.3			1.3
	1974			0.9	0.4	1.3
	1975			1.5	1.0	2.5
	1977				1.2	1.2
	1980			0.2	0.7	0.9
	1981			1.4		1.4
United States	Not available**					

* The ICCAT data appears to include only Cuban commercial operations. While ICCAT area 1570 is primarily Haitian and Dominican waters, a small area in the northwestern quarter is also Cuban waters.
** The authors encountered apparent statistical problems with the U.S. data on the ICCAT web site beginning in 1987. Apparently ICCAT is in the process of recalculating the 1° square data by 5° squares. As a result this data was not added to this appendix.
Source: ICCAT website: http://www.iccat/es/Stats.html, retrieved July 3, 2000.

Appendix B.--Haiti. Swordfish exports by destination, 1991-2000

Destination	Year 1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	Metric tons										
United States	-	-	-	-	-	-	-	-	-	-	-
Japan*	-	-	-	-	-	-	-	-	-	-	NA
European Union	NA	-	-	-	-	-	-	-	-	-	NA
Others**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total	NA	-	-	-	-	-	-	-	-	-	NA

* Swordfish shipments to other countries are believed to be non-existent or negligible
Source: Various

Appendix C1.--Hispaniola#. Seabird nesting, 1984

Area	Information	Species*	Known** threats	Importance***
Navassa Island##	Poor	3?, 7, 9, 10, 12?, 13?, 14?, 16? 18?, 19, 22	Pr?, Ex?, Ha?	Important
Haiti###	Poor	1, 3?, 6, 7?, 10, 11?, 12?, 16? 18, 19, 20?, 22	Ex, Ha, Pr?	Extremely important
Dominican Republic				
Mainland	Reasonable	1, 3?, 6, 7?, 11, 12, 13?, 14? 16?, 17?, 20, 22?	Ex, Ha, Pr?	Important
Beata and Alto Velo	Reasonable	6, 10, 11, 16?, 18?, 19, 20, 22?	Ex, Ha?, Pr?	Extremely important
Saona and Catalinita	Poor	7, 11?, 12, 16?, 17?, 18?, 20, 22	Ha, Ex	Important
Bahía Samaná###	Poor	7, 10, 11, 14?, 16?, 18	Ex, ?	Important

Hispaniola includes both the Dominican Republic and Haiti and we have included the associated offshore cays.
Navassa is a guano island under U.S. jurisdiction. Haiti also claims the island.
Including offshore cays and islets
* Species: 1 - Pterodroma h. hasitata; 3 - Puffinus I. lherminieri; 6 - P. lepturus; 7 - Fregata magnificens; 10 - Sula leucogaster; 11 - Pelecanus occidentalis; 12 - Larus atricilla; 13 - Sterna maxima, 14 - S. sandvicensis acuflavida; 16 - S. dougallii; 18 - S. anaethetus; 19 - S. fuscata; 20 - S. (albifrons) antillarum; 22 - A. stolidus
** Threats: Ex - exploitation of eggs, young or adults; Pr - predators, generally introduced mammals; Ha - habitat destruction or disturbances; Po - pollution; Fi - fisheries
*** A rough subjective rating of relative importance of area for breeding seabirds.
Source: Ruud van Halewyn and Robert L. Norton, "The status and conservation of seabirds in the Caribbean," in J.P. Croxall, P.G.H. Evans, and R.W. Schreiber (eds.), "Status and conservation of the world's seabirds," *ICBP Technical Publication*, No. 2 (ICBP: Cambridge, 1984), pp. 175-176.

Appendix C2.--Navassa Island#. Bird observations, 1998

Species		Number observed
Bonaparte's Gull	Larus philadelphia	1
Brown Booby	Sula leucogaster	12
Cliff Swallow	Hirundo pyrrhonota	6
Cory's Shearwater	Calonectris diomedo	2
Magnificent Frigatebird	Fergata magnificens	11
Masked Booby	Sula Dactylatra	2
Pomarine Jaeger	Stercorarius pomarinus	1
Red-footed Booby	Sula sula	8

Initially claimed by U.S. citizens under the Guano Act, the status of Navassa Island today is under litigation in U.S. courts. The island and surrounding water is a unique marine ecosystem. Since Navassa is uninhabited and remote, it can provide an important platform for researchers to examine a Greater Antilles habitat that remains in a relatively unexploited state.
Source: NMFS Southeast Fisheries Science Center, "NOAA Ship *Oregon II* Cuise OT-98-02 (231) 07/24-09/22/98," *Cruise Results: Coastal Shark Assessment* (NMFS Pascagoula Facility: Pascagoula, Mississippi, January 8, 1999).

14

JAMAICA

Jamaica has one of the most heavily exploited fisheries in the Caribbean. Catches have not increased despite significant increases in fishing effort. Efforts to effectively manage the country's fishery have proven largely ineffectual. The large numbers of artisanal fishermen operate from many scattered landing site have made it very difficult for fishery officials with limited resources to monitor and control. Many fishermen operate without even registering. Jamaica will need to expand the currently small pelagic fishery if it is to increase the fisheries catch. The authors have noted, however, no serious effort to initiate a commercial longline fishery. Several research assessment studies have been done on oceanic pelagics. An effort in 1989 to initiate a swordfish fishery with small boats proved unsuccessful. Jamaican fishermen have been discouraged by the highly seasonal catch rates experienced when fishing for oceanic pelagics. Researchers were somewhat surprised at the better than expected swordfish catch rates reported by U.S. longline fishermen operating off Jamaica in 1990. An artisanal longline fishery was considered in the mid-1990s, but Jamaican officials decided to use available Japanese aid to improve facilities at Pedro Cay and at sites in western Jamaica. Jamaican fishermen do not currently operate commercial longliners and the authors have noted no effort to acquire any. Fisheries officials, however, continue to be interested in promoting pelagic longlining.

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Figure 1.--Map of Jamaica

I. Overview

A. Background

Arawaks were the first inhabitants of Jamaica, which they called Xaymaca, meaning "isle of springs" because of the abundant of fresh water. Jamaica was discovered by Columbus in 1494. The Spanish began settling the island in 1509. Britain in 1655, under Oliver Cromwell, seized the island from the Spanish. The English established a base at Port Royal across the harbor from what is now Jamaica's capital--Kingston. The new English settlement at Port Royal became the center of English privateering, in essence legalized pirating on the high seas, under the direction of the buccaneer Henry Morgan. English possession of Jamaica was confirmed by the Treaty of Madrid in 1670. Sugarcane farming was established and immense fortunes were made producing sugar. So many black slaves were imported to operate the plantations that Jamaica became one of the world's principal slave-trading centers. Slavery was not abolished until 1838.

The British introduced internal self government in 1944 and gradually extended the role of the local government. Full independence was granted within the Commonwealth in 1962. The British Crown appoints a Governor upon the advice of the Prime Minister. The government is a Westminster-style parliamentary democracy with an elected House and a nominated Senate.

Jamaica is located in the western Caribbean, about 150 km south of Cuba. It is the third largest Caribbean island, after Cuba and Hispaniola. Jamaica is one of the most familiar Caribbean islands to Americans and a major destination for American tourists.

B. Fishing industry

The Jamaican fishing industry is largely artisanal and small scale. Some authors have noted, however, that it is surprisingly diverse and complex.[1] Fishermen still operate from open dugout canoes, although these are gradually being replaced by improved fiberglass boats. The artisanal craft vary from 4-meter (m) dugouts to 15-m vessels constructed of plywood and fiberglass. Some decked boats 12-20 m in length work the offshore banks. CARICOM estimates that 4,000 mostly artisanal craft are active in Jamaica.[2] Other sources offer only slightly smaller numbers of 3,500 registered boats.[3] Most are artisanal dugouts canoes--only about 5 percent of which are decked. Open mechanized canoe type boats are made of either wood or fiberglass, 4.3-7.6 m in length and propelled by outboard engines or oars. A 1988 estimate suggested that about 55 percent of the small artisanal dugouts had outboard motors.[4] This proportion has increased in recent years. Decked vessels are predominantly made of fiberglass and are 15-30 m in length.[5]

The Government estimates that there are about 20,000 fishermen. CARICOM reports, however, that many fishing licenses are not currently valid. There is no firm estimate of the ratio of full-time/part-time fishermen. There are approximately 1,000 fishermen permitted to fish on the productive offshore Pedro and Morant Cays.[6]

Jamaican fishermen use a variety of gear, depending on the specific fishery.

Demersal fish: The demersal reef fishery is primarily a trap and line fishery. Traps made by the fishermen themselves account for more than half of the catch.[7] The traditional Caribbean-style "Z"-traps are most common. A handful of artisanal fishermen deploy small bottom longlines, primarily for demersal species. Catch rates reported by the fishermen declined sharply in the 1980s.[8]

Pelagic fish: Fishermen targeting pelagic species use some seines and gillnets.[9] The larger oceanic pelagics

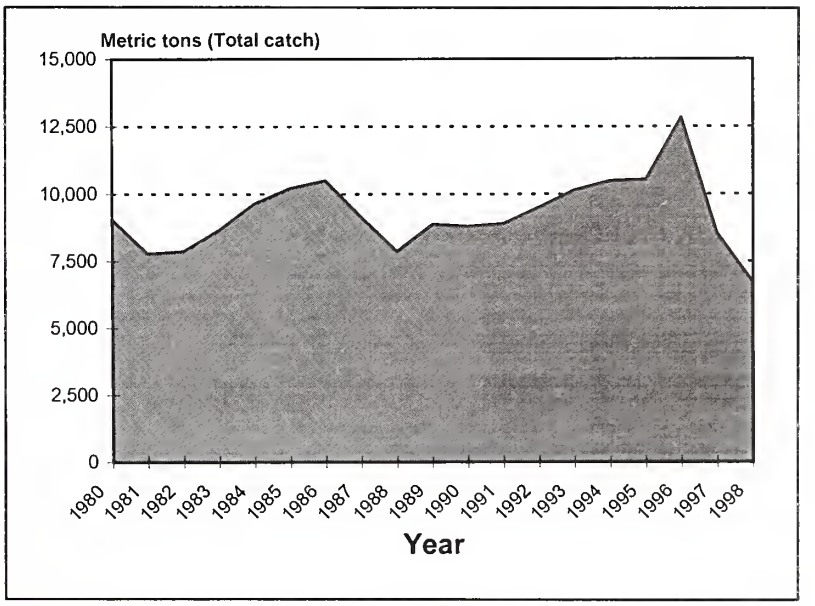

Figure 2.--Jamaican fishermen have reported a sharp drop in the overall fisheries catch during recent years, due in part to the intense fishing effort.

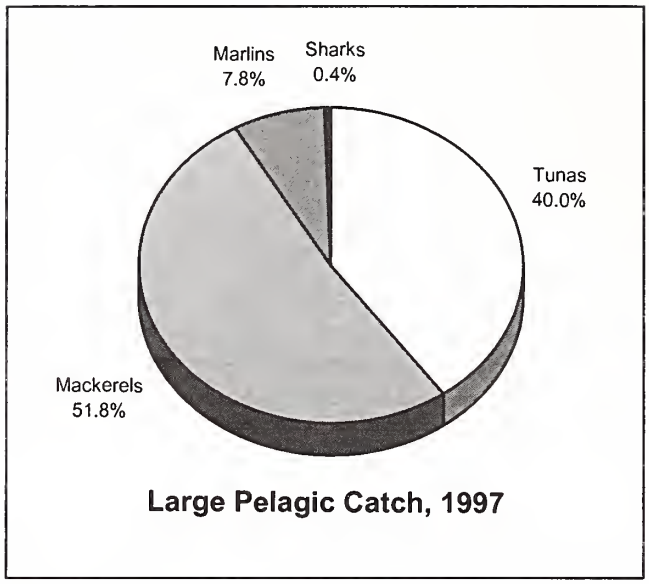

Figure 3.--Tunas (yellowfin, blackfin, and other species) and mackerels dominate most of the Jamaican catch of large pelagics.

are taken by line fishing. Fishermen use hand lines, trolls, and some artisanal longlines which account for about 17 percent of the catch.[10] Coastal pelagics are taken by gillnets and seines. Small quantities of small pelagics are taken by gillnets set in bays, mangroves, and seagrass beds close to the coast.[11] Nets account for about 23 percent of the catch. The authors know of no commercial longlining.

Conch and lobster: Conch are mostly gathered by SCUBA and hook gear. Lobsters are also taken by divers, but traps are also used. Diving accounts for about 6 percent of the Jamaican catch.[12] Commercial scale exploitation began in 1991.[13]

The two principal components of the Jamaican fisheries catch are various marine fish, both demersal and pelagic, and conch. These can account for up to 90 percent of the catch.[14] **Demersal fish**: Jamaican fishermen take over 200 different species of reef fish, although a much smaller number are of commercial significance. The most important species are groupers, snappers, grunts, goatfish, parrotfish, surgeonfish, and squirrelfish. Declining catches of demersal fish is a problem in many Caribbean countries and this appears to be especially the case in Jamaica.[15]

Pelagic fish: Fishermen take both large pelagics like yellowfin tuna, blue marlin, dorado (dolphinfish), and sharks as well as a variety of smaller inshore pelagics such as herrings, anchovies, halfbeaks, mullets, and jacks.[16]

Conch: Five species of conch are found in Jamaican waters, although the queen conch is the one of greatest commercial value. Conch is an important part of the Jamaican catch, totaling about 2,800 t in 1994. Some reports suggest that conch is being extensively overfished. Catches declined to less than 1,400 t in 1999. A recent report suggested that the current fishery is sustainable.[17]

Lobster: Lobster is a smaller part of the catch, but an important component in terms of value.

Jamaica has one of the largest numbers of artisanal fishermen in the Caribbean despite the relatively limited coastal resources. As a result, inshore grounds are extremely over fished. Low catch rates, increasingly small sizes, and low incomes have caused some fishermen to adopt destructive methods such as the use of dynamite. The fishermen were using dynamite in the 1960s and more recent reports suggest that the practice continues.[18] The intense pressure on coastal resources appears to be increasing. This reduces already low yields even further.

Very little data is available on Jamaican fishery catches. The Government has not provided the FD the support and funding to collect fishery statistics. FAO estimates that Jamaican fishery catches since 1980 have varied from 7,800 t (1981) to 12,800 t (1986) (appendix A1). The FD warns that actual surveys were conducted only in 1981 and 1996, but that data on the intervening years are only rough estimates.[19] Recent data has indicated a precipitous decline in the Jamaican catch to only 8,400 t in 1997 and 6,700 t in 1998. The 1999 catch recovered to 8,500 t because of somewhat improved marine fish catches.

The FD provides only limited data on the species being caught by Jamaican fishermen. Normally over half the catch is marine fish, although much of the value of the catch is shellfish, both lobster and conch. The pelagic fin fish catch is mostly mackerel and tuna, along with small quantities of billfish and shark (appendix A3). While data is not available on catch trends in these fisheries, anecdotal reports suggest that catches of once important species have declined markedly. A group of U.S. AID fishery consultants noted that in many restaurants only one type of fish was available--even in coastal areas. While offered as "Caribbean snapper," it was actually pond-raised tilapia.[20]

Fishermen generally conducted inshore fisheries until the mid-1950s when the Government initiated a program to help them acquire larger boats and motors. The fishery was further extended in the late 1960s when larger boats and more powerful motors allowed some of the fishermen to reach Pedro Bank.[21] The fishery peaked in the mid-1980s as fishermen expanded operations on offshore banks and again in the mid 1990s (appendix A1). The fisheries catch declined

sharply in 1997 to only 8,400 tons. Once the cultured production is excluded, the current Jamaican catch is actually below the level reported in 1980, despite the substantial increase in effort. The catch of spiny lobster, the most valuable species targeted by the fishermen, has shown a sharper decline from 550 to 100 tons. The fishermen since 1991 have greatly expanded a commercial offshore fishery for conch. Harvest levels in the offshore conch fishery have been maintained by diving in deeper waters using SCUBA and Hookah.[22] The catch of both lobster and conch fell sharply in 1997 and 1999 and the lobster catch fell further during 1998. This has significantly reduced earning.

The largely artisanal catch is landed at many scattered beach sites all along the island, but especially along the southern coast. The small quantities landed by fishermen operating dugouts is sold to the large number of vendors who take the fish to nearby towns where it is sold in the central market. The Fisheries Division (FD) estimated that there may be 3-4 vendors for every fisherman.[23] The carrier boats servicing the fishermen operating on the offshore banks land their catch at Kingston.[24]

Fish is popular in Jamaica and there is a strong demand for seafood. Most of the Jamaican catch is sold fresh locally. The level of domestic consumption is surprising given the low level of domestic production. Consumption is limited, however, because of the low income level of many Jamaicans.[25] As a result of the small catch, substantial quantities of seafood are imported.[26]

Some of the more valuable seafood products are exported, especially the lobster, conch, and snappers. The export shipments, however, usually do not offset much larger imports. Imports are limited to some extent because the country's large tourist industry provides a ready local market for high valued seafood. Jamaican seafood exports are highly variable.

Exports: Jamaican fishery exports fluctuate widely. FAO has reported seafood exports ranging from only $1.6 million in 1994 to $25.7 million in 1996 (Caribbean Overview, appendix F1b). The lower range reported by FAO seems unlikely as U.S. import data in 1994 indicated that $9.9 million was shipped from Jamaica (appendix B2d). Jamaican export shipments in 1998 totaled an estimated $13.4 million and in 1999 $13.9 million (Caribbean Overview, appendix F1b). The principal export market is the United States. Shipments in 1998 and 1999 were $11.0 and $12.8 million respectively, more than 85 percent of which was conch and lobster. There was also over $1 million of cultured tilapia.[27] U.S. import data suggests that Jamaican imports dropped notably in 2000 (appendix B2d).

Imports: Jamaican seafood imports in most years substantially exceed exports. Imports in recent years have ranged from $26 million (1997) to over $50 million (1996). Shipments in 1999 totaled over $32 million (Caribbean Overview, appendix F1a). The most important seafood import is usually cured fish used in traditional dishes, but substantial quantities of frozen and canned fish are also imported.[28]

Fisheries is generally thought to make only a small contribution to the national economy. The latest estimate provided by the Jamaican Government is that the fishing industry accounts for about 0.5 percent of the national economy in 1991.[29] Some fishery experts, however, believe that the actual contribution could be much larger.[30] The fishing industry certainly provides an important renewable source of local protein production. The industry also provides employment for a substantial number of people with little training or capital. About 3 percent of the Jamaican labor force is employed in fisheries.[31]

Jamaican fishery officials face daunting problems. Many of these problems are the same as noted in the

Photo 1.--Jamaican fishermen in the 1960s were using their small canoes to deploy fish traps on the Pedro Bank, a difficult and dangerous undertaking. Larger boats are now used. C. Kaufman

1980s.[32] The limited financial and material resources available to the FD is making it difficult to address the problems faced by the fishing industry.

Environmental trends: Coastal mangroves and wetlands, which are important breeding, and nesting grounds, are being developed. Pollution is an increasing problem. The siltation of many lagoon areas has been noted. While overfishing is probably the principal cause of the declining catch, officials also point to severe hurricane damage to reefs, viral diseases cropping black sea urchins (important for cropping algae off corals), pollution, and the loss of wetlands and sea grass areas as a result of coastal development as other important factors.[33] While this report focuses on pelagic resources, damage to Jamaica's once pristine reefs has had major consequences for the fishing industry.[34] Clearing of native vegetation for charcoal production has resulted in increased erosion of hillsides and increased sedimentation of inshore areas. This has also adversely affected fishery yields. Other coastal management issues include pollution from urban sewage, agricultural runoff, and industrial effluents. There are also conflicts with the tourist industry.[35]

Photo 2.--These live lobsters were being landed by a Jamaican canoe fisherman in the 1970s. Lobster continues to be Jamaica's most valuable fishery. Karl Aiken

Increasing effort: The number of fishermen is increasing. One source reported that the fishery has increased from 2,500 canoes and 7, 500 fishermen in 1962 to 9,500 canoes and 18,700 fishermen in 1990.[36] More current numbers are not available, but there is no reason to think that the long term trend has reversed. The increased effort is largely due to Jamaica's expanding population and high unemployment rate, leaving few alternatives for many unskilled Jamaicans in coastal villages. Economic difficulties have caused unemployed Jamaicans to enter open access sectors such as fisheries.[37]

Catch trends: While only limited statistical data is available, a variety of indicators suggest that the Jamaican fishery is declining, especially the small size of the fish being caught. Government officials are also concerned about the decline of species diversity. Declining populations of reeffish like snapper, grouper, and jacks are of great concern.

Declining yields: Declining yields appear to be due to the increasing effort and the use of harmful practices such as fine mesh nets that take juvenile fish. Other practices such as dynamiting are even more harmful. The declining yields are particularly notable in the inshore fishery.

Management limitations: The DF, because of its limited budget, has been unable to implement an effective management program. One notable impediment is the lack of a system to collect fisheries catch and other data needed for management and enforcement purposes.

Costs: Rising costs for fuel and equipment discourage long trips, intensifying pressure on inshore resources.

Larceny: The DF reports increasing incidents of stealing fish pots which they believe is due to rising cost of materials, entry of new inexperienced fishermen, declining yields, lack of enforcement, and over crowding on inshore grounds. These incidents as well as cases of embezzlement have adversely affected the development of a cooperative movement.[38]

Other: The DF reports a variety of other problems including an ineffectual cooperative movement, deteriorating roads reducing market access, and environmental degradation.[39]

Photo 3.--Discovery Bay is a protected inlet along the north coast. Notice the small open boats that the fishermen were still using in 2000. Karl Aiken

II. Species

The authors know of no studies describing swordfish off Jamaica. Some limited data is available from foreign researchers or other sources on neighboring islands.

A. Spawning

The spawning grounds for swordfish are primarily deduced by the location and abundance of swordfish larvae. One 1983 study reported that there is relatively little spawning within the Caribbean itself, although some limited spawning does take place south of Cuba to the west of Jamaica. Considerable spawning activity is reported off western Cuba, both in the Yucatan and Florida straits (Cuba, figure 4). Most of it appears to occur north of western Cuba in the Gulf of Mexico. Significant concentrations of small larvae have been found there.[40] University of Miami biologists, in a recent research project begun in 1998, obtained larvae from the waters off Jamaica and once evaluated, more detailed information on larval abundance should be available.[41] Notably this is an area from which larval swordfish can be transported by the Caribbean Current through the Yucatan Channel and into the western Gulf and Mexico and north by the Gulf Stream along the U.S. eastern coast to Cape Hatteras, the northern limit for significant concentrations of larval swordfish. The larger larvae found off Hatteras may well be from fish spawning off western Cuba. Larvae are present throughout the year in the western Caribbean and Gulf of Mexico, but most prevalent in the late fall and winter. Some larvae have also been found in the Windward passage between Cuba and Haiti to the northeast of Jamaica.[42] A 1998 analysis shows a similar pattern of larval concentrations in the Gulf of Mexico and U.S. southeastern coast, but more limited concentrations west of Jamaica south of Cuba and no larvae found in the Windward Passage between Cuba and Haiti to the northeast of Jamaica (Venezuela, figure 10).[43]

B. Migrations

Information on swordfish migrations in the waters around Jamaica are covered in the chapters of the neighboring islands, especially the Cuban chapter of this report.

III. Grounds

A. Topography

Jamaica is the major outcropping of an underwater ridge connecting Honduras, and Nicaragua with Haiti. To the north off the islands narrow shelf is the deep water of the Cayman Trench--the deepest water in the Caribbean. To the south is the extensive Colombian Basin.

The island of Jamaica is about 250 kilometers long, but only about 75 km across at its widest point. The island narrows considerably at its western and eastern ends. Thus there is in essence a southern and northern coast, but no eastern and western coast. Jamaica is rimmed by a narrow coastal plain with many bays, except along the southern coast where there are extensive flatlands and areas of the coast are straight and unindented. The limestone interior of the island is dramatically sculptured. The highest elevation is located in the eastern end of the island where Blue Mountain rises to 2,220 meters.

Southern coast: The shelf along the southern coast is relatively wide (maximum about 25 km). The mean depth is only about 20 meters. As a result, the country's fishing industry is primarily based along the southern coast. Small patches of corals, gorgonians, and seaweeds are interspersed with sandy patches and large reefs on the eastern portion. Well-developed sill reefs with massive corals occur along most of the edge of the shelf along the southern coast. The seagrass and soft corals cover a sand and limestone bedrock. Coralline growths are often concentrated at the edges.[44]

Northern coast: The northern shelf is extremely narrow (maximum about 1.6 km). It is characterized by fringing reefs with few gaps which are virtually contiguous with the sill reef. Many of Jamaica's important tourist resorts are located along the northern coast where the beaches are white and sandy.

Eastern and Western coast: Due to Jamaica's configuration, there is only a small eastern and western coast and conditions are much like the northern coast.

Many shallow water banks and cays are located to the southwest between Jamaica and Central America.

Inshore banks: There are nine adjacent small banks along Jamaica's southern coast which can be accessed even by fishermen with small boats. These banks have been heavily fished by Jamaican fishermen and yields have declined markedly.

Offshore banks: There are also more productive offshore banks to the south of the island.[45] Deepwater and some distance separates Jamaica from these offshore fishing banks. The edge of the Jamaican shelf has a near vertical descent into deep water. Morant Cay and Pedro Bank rise abruptly from depths exceeding 500 m to form a submerged plateau with average depths of only about 20 to 30 meters.[46] The most important is Pedro Bank which is the only one of the large banks in the western Caribbean that falls within the Jamaican 200-mile EEZ. Despite the fact that Colombia is located far to the south, many of these banks and cays are claimed by Colombia--although Nicaragua disputes some of these claims. Depths on Pedro Bank range from 0-50 meters. The central area of the Bank is dominated by silt and sand with areas of

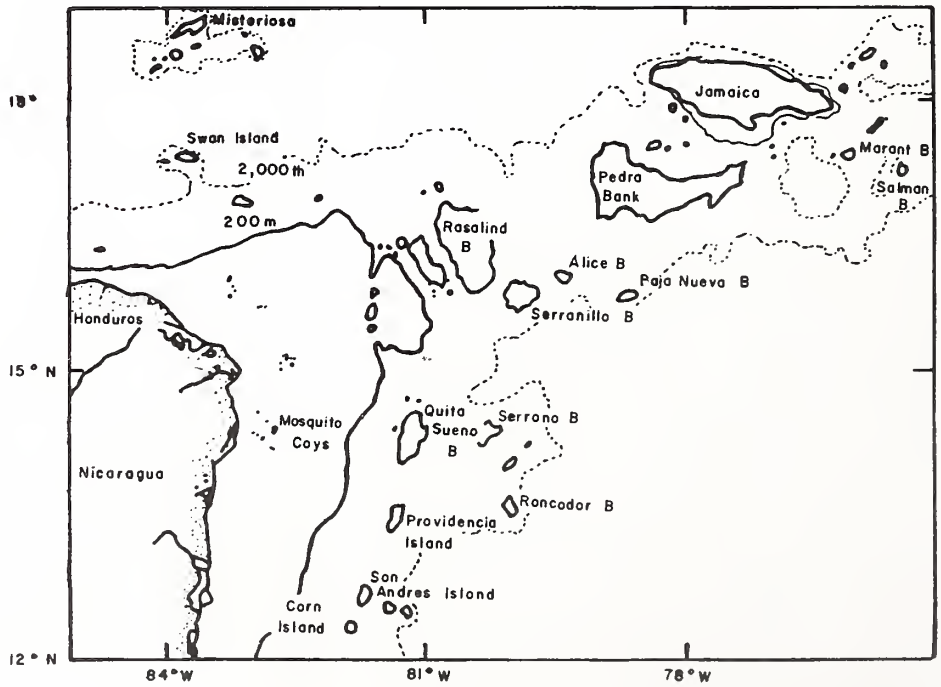

Figure 4.--The western Caribbean, southwest of Jamaica is a series of shallow banks and small cays. The only major one in Jamaican waters is Pedro Bank. Aiken

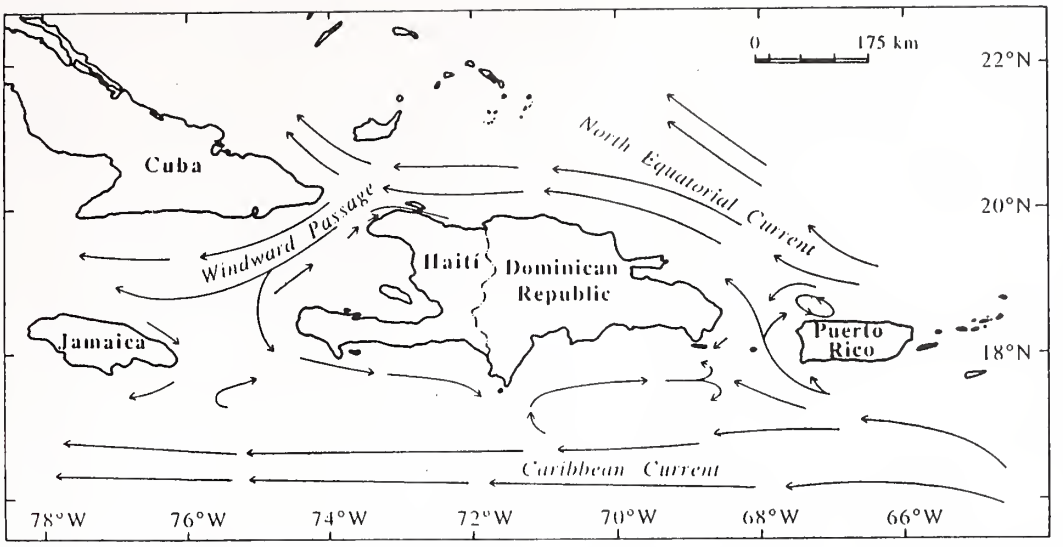

Figure 5.--Jamaican fisheries are primarily conducted along the southern coast and on the cay and banks off the southern coast and are thus influenced by the Caribbean Current. Appeldoorn and Meyers

sparsely dispersed patches of sea grass, algae, and coral heads[47]. The most productive areas are the edges of the Bank.[48] Beyond the reefs which fringe the banks the drop can be nearly vertical. Fishermen use three uninhabited sand cays on the eastern fringe of Pedro Bank as a base of operations. Some Jamaican fishermen actually reside on these cays for months at a time, delivering their catch to carrier vessels. Other fishermen live along Jamaica's southern coast, traveling to the banks on a daily basis.[49]

B. Oceanography

1. Wind regime

Jamaica and Pedro Bank lie in the middle of the zone of northeasterly trade winds and wind speeds of 30 knots are not uncommon. Average wind speeds are 15-20 knots. Wind speeds exceeding 15 m/second and associated choppy seas are common from March to September. A calmer period occurs from October to February.[50]

The annual hurricane season is usually from July to October. Most hurricanes miss Jamaica, either traversing the Caribbean to the south of Jamaica or take a northerly course, veering to the north of Cuba.

Hurricanes can, however, have a substantial impact on the fishing industry--as is the case in many Caribbean islands. Hurricane Gilbert in 1988 was a particularly devastating storm, fishermen lost almost all their active traps at sea and many boats were damaged. The long term impact on resources is not yet well understood.[51] Hurricane Mitch in 1998 was another devastating storm.[52]

Following the hurricane season, a period of relative calm usually extends from October to February, interspersed by sometimes violent northerly storms. As a result of the relatively windy weather experienced around Jamaica, and the consequently choppy water often encountered, fishermen in vessels of less than about 14 m long are subject to difficult, if not hazardous, working conditions.

Photo 4.--Many fishermen live on isolated cays for several months while fishing on Pedro Bank. C. Kaufman

2. Current regime

The dominant surface current affecting Jamaica and the Pedro Bank is the Caribbean Current, a branch of the North Equatorial Current. The Current flows westward within the Caribbean, exiting through the Yucatan Channel to enter the Gulf Stream system. Currents around Jamaica are predominately westerly and flow from 0.5-1.0 knots.[53] Tidal effects are slight. Average surface temperatures to a depth of 75 m are between 26.5°-29.5°C.[54]

Jamaica lies almost directly on the current shift axis between the Caribbean Current and a branch of the Antillean Current (or North Equatorial Current) which flows westward along the northern coast of the Greater Antilles (Puerto Rico and Hispaniola). The Current penetrates the Cayman Basin through the Windward Passage (between Cuba and Haiti).[55] A branch of the Antillian current periodically moves through the Jamaica Passage (between Jamaica and Haiti) and turns westward, flowing along the south coast of Jamaica. These waters are relatively easy to identify. The Caribbean Current is warmer and has lower salinities.[56]

U.S. naval pilot charts show that the current shift axis is generally found south of Jamaica between September and February and north of Jamaica between March and August. The extent of this shift appears related to the Trade Winds. University of the West Indies researchers speculate that oceanic pelagics such as marlins and tunas may be associated with the shift axis, although evidence is scanty.[57] Swordfish may also be associated with this shift, although the species was not mentioned by the UWI researchers. The shift may not move sufficiently south for the Antillean Current to reach Pedro Bank. The extent and timing of these current shifts, however, may significantly influence the recruitment of larval and post-larval fish to Jamaican reefs.[58]

C. Fishing grounds

Jamaican fishermen operate on a small area of shelf and shallow offshore banks. The coastal shelf area is about 4,170 square km; the offshore banks total about 7,900 square kilometers.[59] Most Jamaican fishing takes place along the edges of the banks which have the best developed reefs. The main fishing grounds are the inshore waters around Jamaica and nine small oceanic banks. Pedro Bank 150 km southwest of Kingston is also regularly fished.

South coast: Jamaican fishermen primarily operate along the island's southern coast where there is a relatively large shelf. Fishermen venture further offshore along the southern coast, but report that most trips are within 30 km of the island.[60]

North coast: Fishermen along the northern coast concentrate on the narrow shelf which in places only extends about 1-km offshore.[61]

Offshore banks: Fishermen also operate on a number of offshore banks, the most important of which is the Pedro Bank to the south of the island.[62] Fishing also takes place around Morant Cay to the south east of Jamaica. Some 600 fishermen in 1988 fished on the banks for up to 4 months at a time. Three uninhabited sand cays on the eastern fringe of Pedro Bank are used as a base of operations. A more recent report suggests that this has fallen to 300 fishermen.[63] These fishermen were served by 11 carrier vessels which provide water, fuel, and provisions and pick up their catch which is then landed in Kingston.[64]

Photo 5.--This Jamaican fisherman is limited to inshore waters with his canoe and small outboard. Note the sparse catch for the day. C. Kaufman

Exploratory fishing surveys indicate that there are still areas of the western Caribbean where fishery resources are not fully exploited. Most of the areas within Jamaica's 200-mile EEZ, however, are fully exploited. Jamaica would need to negotiate with neighboring states, especially Colombia, for access to the grounds that are not fully exploited. Prospects for such negotiations are not good. Jamaica did negotiate with Colombia for access to Bajo Nuevo and Serranilla Banks, located well south of the Pedro Bank. The access agreement, however expired in 1986.[65]

IV. Fleet

Jamaican fishermen primarily use open canoes in the country's still largely artisanal fishery. About 95 percent of Jamaica's fishing fleet is composed of canoes. The canoes were mostly small wooden dugouts or plank-built until larger fiberglass canoes began to appear during the 1970s.[66] The canoes range in size from small 4-m canoes that are used along the coast to 18-m that are used on Pedro Bank. One 1993 report indicated that some fishermen were still using oars. Most of the canoes are now powered by outboard motors. There are also some decked vessels 12-20 m long. Carrier boats 10-26 m long are based in Kingston and service the fishermen operating for extended periods on Morant Cay and Pedro Bank.[67]

Jamaican fishermen do not operate commercial longliners. A few fishermen attempted to deploy artisanal longlines in 1989, but with little success. The Fisheries Division continues to be interested in longlining for oceanic pelagics, especially a small-scale operation.[68] The authors have no information, however, that Jamaican fishermen are actively considering longline operations at this time.

V. Shipyards

Artisanal fishermen have traditionally purchased their dugout canoes from local shipwrights. A few yards now produce fiberglass boats. There are no shipyards in Jamaica producing commercial longliners.

VI. Fleet Operations and Gear

A. Artisanal

Artisanal fishermen utilize a variety of gear, depending on where they operate. The principal gears are traps (pots), nets (and beach seine, tangle, and gill nets) and to a lesser extent handlines, spearfishing, and some use of explosives. Net fishing has increased, in part because so many traps are stolen.[69]

Fish trap fishery: The trap ("pot") fishery is conducted on the island shelf and the offshore banks and cays. Most of the landings are taken on the Jamaican shelf south of the island and consist of reef fish. The Jamaican version of the Caribbean "Z" trap is the dominant trap design. The pots are deployed near, but never on reefs at depths of 20-40 meters. They are baited and deployed individually for up to 6 days. Newer pop-up floats are becoming popular because of the theft problem. Officials are concerned about the declining diversity of the reef species taken in the trap fishery. Some fishermen deploy multiple gears. One report indicated that nets deployed by these fishermen include catches of sharks and rays.

Spiny lobster: Substantial quantities of lobster were harvested from the Pedro Bank during the 1980s using Florida-style slat traps. The fishery apparently depleted the resource as there have been no substantial catches during the 1990s; although some lobsters are taken incidentally in the pot fishery along Jamaica's southern coast. Much of the effort once involved in the lobster fishery has shifted to the conch fishery.

Conch and other mollusks: The conch fishery was minimal during most of the 1980s. The lobster fishermen, however, shifted to conch when lobster catches plummeted. Catches expanded from 50 t in 1989 to over 2,000 t in 1994. The primary fishery is conducted on Pedro Bank by divers. Catches in recent years have declined because of the intensive fishing effort. Other mollusks, especially oysters, are harvested in mangrove areas.

Small pelagics: A variety of small pelagic species are taken with gillnets along the southern coast. These species constituted about 12 percent of the south coast catch in 1996.[70]

Large pelagics: The catch of large pelagics is a minimal part of the Jamaican fishery. The authors know of no pelagic longlining currently conducted in Jamaica. Most of the large pelagic catch is taken by canoes used for trolling.[71] Artisanal canoe fishermen report occasional catches of three billfish species (blue and white marlin and sailfish). The Fisheries Division conducts sporadic sampling.[72] Catches are best from October to March. Jamaican fishermen attempted to

Photo 6.--Jamaican fishermen once relied heavily on traps. In recent years many fishermen have begun using monofilament gillnets. Karl Aiken

launch a swordfish fishery in 1989. A few fishermen attempted to use small boats to deploy artisanal longlines to depths of about 300 meters. Chemical light sticks were added to baited hooks. Catches consisted of tunas, mackerels, dorado, blue marlin, sailfish, swordfish, sharks, and barracuda. The seasonal availability of these species appears to have been a factor in the failure of the swordfish effort as well as the limited development of a Jamaican fishery for other oceanic pelagics.[73] The authors know of no commercial longline fishery currently active in Jamaica targeting these species.

Shrimp: A modest artisanal shrimp fishery is conducted at the mouths of several small rivers.[74]

Most fishermen along the southern coast, who are commonly full time fishermen, deploy a combination of gear, primarily traps and nets. The primary trap is the traditional "Z" shaped Caribbean traps. Fishermen operating on the Pedro Bank mostly deploy traps. Fishermen operate off the Cays with canoes to haul these traps. They are sustained by carrier boats that move between Kingston and the cays and offshore banks. The carrier boats bring supplies to the semi-resident fishermen and return with loads of iced fish.[75] While traps are the principal gear, some fishermen deploy hook and lines, but only a few use small longlines. Most of the longlines are bottom lines. There are relatively few pelagic (floating) lines set.[76] Jamaican fishermen are increasingly using monofilament gillnets. Fishermen have been complaining of damage to their nets by oil spills. The Fisheries Division reports in 2001 that it is involved in litigation with an oil company over oil damage to monofilament nets.[77]

B. Commercial

The Jamaican fishery is largely artisanal. A few larger boats have been deployed including an occasional trawler. The expanding conch fishery on Pedro Bank in recent years has brought about the development of a commercial fishery--one of the few such fisheries in Jamaica. There is, however, no commercial fishery for oceanic pelagics. The small Jamaican pelagic catch is taken by artisanal fishermen deploying trolling gear.

C. Recreational

Only limited information exists on the Jamaican recreational fishery. One good review published in 1989 is now somewhat dated.[78] A more recent report published in 1993 assessed the billfish catch of artisanal and recreational fishermen. Unfortunately the relative importance of the two fisheries is not clearly stated. The report did indicate that blue marlin constituted 91 percent of the catch in 1990, with smaller quantities of

white marlin (4 percent), swordfish (3 percent), and sailfish (2 percent) also reported. Historic data obtained from tournament records showed no discernable decline in blue marlin sizes or CPUEs.[79]

Several billfish tournaments are held in Jamaica. Billfish tournaments have been held fairly regularly along the northern coast for many years, providing a good time series for CPUE estimates. ICCAT reports that voluntary release programs have become increasingly common.[80] Most of the tournaments are held in the fall.[81] The most important is the Discovery Bay Fishing Tournament, usually held in October.[82] The first Discovery Bay Tournament was held in 1993. ICCAT in 1994 planned to sample the October Port Antonio billfish tournament.[83]

Jamaican sport fishermen have sought to minimize conflicts with commercial fishermen. One of the principal methods has been to include an event for the artisanal or small-scale commercial fishermen in the recreational tournaments. This approach has reportedly proven very successful.[84] This may be a useful model elsewhere in the Caribbean. Commercial and recreational fishermen in the Caribbean, while they in some cases are competing for the same resource, often have a wide range of common interests. Cultural differences, however, often prevent them from joining forces to lobby Government officials. Although not always the case, many recreational fishermen are whites and are generally affluent. Many well to do foreigners also participate in the recreational fishery. In contrast, most artisanal and small-scale fishermen are blacks with only marginal or modest income. The Jamaican approach of including the artisanal/small-scale fishermen in the tournaments may help bridge this cultural divide and could be a useful strategy on other Caribbean islands.

VII. Catch

There is no known Jamaican swordfish catch in Jamaica. An effort to target swordfish was launched in 1989 using small boats, but it was not successful. Jamaica has not traditionally reported a swordfish catch and the latest data continues to show that while the catch of large pelagics includes tunas, mackerels, marlin, and shark. No swordfish are reported (appendix A3).[85] The lack of a system to collect fisheries data means that time series statistics for these species are not available.

Early 1950s: The fisheries catch in the early 1950s was only about 5,000 t, although catches approaching 5,500 t had been reported in the 1940s.

1955: Prior to 1955 the Jamaican fishery was entirely limited to inshore fishing grounds. The FD launched a boat mechanization program which allowed fishermen to acquire larger boats with outboard motors. As a result, fishermen were able to begin fishing on offshore grounds like Pedro Bank.[86]

1960s: The vessel mechanization scheme allowed fishermen to increase effort on inshore grounds as well as reach new offshore grounds.[87] The overall fisheries catch increased to over 10,000 t, perhaps reaching 13,000 t in 1963.

1970s: Catches stabilized at about 8,000-10,000 t during the 1970s.[88]

1978: Prime Minister Michael Manley was impressed with the development of the Cuban fishing industry. As with other observers at the time, little attention was given to the Cuban fishery's lack of profitability in market terms. The Ministry of Agriculture drew up a 5-year fisheries development project which involved setting up a state fishing company that would acquire and operate fishing vessels in off shore fisheries. Fishermen were to be initially trained in Cuba.[89] Resource surveys were conducted by the Cubans and Soviets and arrangements were made to train Jamaican fishermen in Cuba. The plan was never fully implemented, in part because of difficulty in obtaining needed financing. Major improvements to the fishing port at Kingston, however, were initiated.

1980s: Catch trends in the 1980s were similar to the 1970s.

1980: Improvements to the Kingston fishing port were completed.

1981: As a result of the FD boat mechanization program, over half of Jamaica's fishing fleet of mostly canoes had been equipped with outboard motors by 1981.

1988: Hurricane Gilbert in 1988 was a factor in significantly reducing the overall catch below 8,000 t (appendix A1).

1989: A short-lived effort to target swordfish using small boats deploying artisanal longlines was reported in 1989.[90]

1990s: Overall catches ranged from 8,300-12,800 t through most of the 1990s (appendix A1). Lower catches, however, were reported at the end of the decade.

1990: A fleet of about six U.S. longliners operated off Jamaica beginning in December 1989. They set lines of from 30-80 km with up to 500 hooks targeting swordfish. They reported catches of up to 450 kg per set which was higher than Jamaican researchers had anticipated.[91] Some of their swordfish and tuna catch was transhipped through Kingston (appendices B2a1 and B2b).

1997-98: Much lower catches were reported in 1997-98. The catch fell to only 6,700 tons in 1998 (appendix A1). The apparent decline, however, may in part be due to improved collection of statistical data. **1999:** A somewhat improved catch of 8,500 t was reported in 1999.

VIII. Ports

Fishermen land their catch at about 170 beach sites all over the island. There are about 10 important sites.[92] Key fishing beaches are located in Old Harbour Bay, Gillings Gully, Port Royal, Rocky Point, and Kingston. The capital of Kingston has the country's only modern fishing port complex. The small fishing port at Newport East in Kingston was completed in 1980 and has concrete berths and other facilities for the larger decked boats.[93] The carrier boats from the offshore fisheries land the catch at Kingston and acquire ice, water, fuel, and provisions for the offshore fishing vessels.[94] Swordfish are not known to be landed at any Jamaican ports.

IX. Transshipments

U.S. swordfish longliners operating in the Caribbean transhipped fish through Kingston in the 1980s.[95] Shipments show up in U.S. import data only in 1990 (appendices B2a1 and B2b). Other than these 1990 shipments, there have been no known swordfish transhipments through Jamaica during the 1990s or early 2000s.

X. Processing and Products

Swordfish is not processed in Jamaica.

XI. Companies

A. Companies

There are no large companies involved in the Jamaican fishing industry. CARICOM reports only one exporter.[96] There appear, however, to be several exporters. Through the 1980s, the largest Jamaican company was the state-owned, Jamaican Frozen Foods.[97] Three of the largest companies in Jamaica are now Aqua-culture Jamaica Ltd., DYC Fishing Ltd., and the Jamaica Seafood Processors Association. The authors know of no Jamaican companies handling swordfish.

B. Cooperatives

The first fisherman's cooperative was established at Port Royal in the 1960s.[98] Officials have tried to promote cooperatives, but have had little success.[99] The weakness of a cooperative movement has had adverse consequences for the Jamaican fishing industry. Some fishery development efforts have tried to promote cooperatives among the artisanal fishermen.[100]

XII. Markets

A. Domestic

Fish and shellfish are staple food items in Jamaica which in the 1980s provided about 35 percent of the population's protein intake. Jamaica once had the highest level of fish consumption in the Caribbean (Cuba, appendix D2b). As a result of population growth, Jamaican consumption levels by the 1990s have fallen more in line with most other Caribbean countries. Jamaican consumption levels have apparently dropped sharply in recent years, given the reported catch declines in 1997-98 (appendix A1).

Most of the Jamaican catch and increasing pond harvest is sold fresh for domestic consumption. Sales may take place at landing sites or other primitive marketing facilities. Jamaican seafood marketing is highly diffuse. One recent report described it as a "higgler" system.[101] Much of the marine catch is landed on beaches and sold in relatively small quantities to a large number of traders who distribute

the catch to population centers through bicycles, carts, and vans. As many as 3-4 persons are thought to be involved in marketing for every one actual fisherman.[102] Only a small part of the catch is marketed through commercial channels. Much of that comes from the fish landed at Kingston, in part delivered by carrier vessels from Pedro Bank and other cays. The more valuable species are sold to hotels and restaurants catering to the Island's important tourist trade. Few rural areas are well served by this system, although the growing pond harvests are making fish more available in some rural areas close to pond operations.

The authors have no information on domestic swordfish consumption and marketing, but believe it to be negligible. The small quantities of other oceanic pelagics like mackerels, marlin, tunas, and sharks are sold in the domestic market. Only occasionally are small quantities of tuna exported (appendix B2b).

B. Trade

1. Exports

There are no known Jamaican swordfish exports (appendix B1). Small shipments to the United States in 1990 appear to have been fish transhipped by foreign fishermen.

2. Imports

There are no significant Jamaican swordfish imports, although tourist hotels and restaurants may import small quantities.

XIII. Government Policy

The Jamaican agency responsible for fisheries is the Fisheries Division in the Ministry of Agriculture.

A. Fisheries law

The principal Jamaican fisheries law is the 1975 Fishing Industry Act. The Act prohibits fishing without a license and provides for the licensing of fishermen and boats. The Act is the basis for fisheries management and allows the Government to establish sanctuaries and to set closed seasons. The Government is authorized to prohibit certain fishing methods and to implement measures for fisheries conservation.[103] Court challenges to DF management efforts in 1999 highlighted the need for an updated fisheries law.[104] The DF with the assistance of FAO has prepared a new fisheries law. Officials were hopeful that it would be passed by Parliament in 2000.[105] As of September 2001, however, it had not yet been passed.[106]

Other legislation affects fisheries. Two are of particular importance. The Morant and Pedro Cay Act (1980) provides for licensing fishermen operating on the offshore cays. It also prohibits the removal of birds and turtles. The Wildlife Protection Act (1964) provides the legal authority for wildlife conservation. It prohibits dynamiting and poisoning of fish as well as the catch of immature fish and turtles (including eggs). The law also provides for the establishment of game sanctuaries and wardens.[107]

Regulating Jamaican artisanal fisheries has proved to be a difficult undertaking.[108] The large number of artisanal fishermen operating from scattered beaches combined with the country's limited surveillance capability make enforcement of fishery regulations very difficult.

B. Limits

Jamaica declared a 12-mile Territorial Sea in 1971.[109] The country declared a 200-mile Exclusive Economic Zone (EEZ) in 1991.[110] Jamaica has negotiated marine boundary agreements with Colombia (1994) and Cuba (1994). The Law of the Sea Convention was signed in 1982 and ratified in 1983.

C. Fisheries management

Jamaica fishery officials have recognized for several years that the country's coastal resources are severely overfished, despite the inadequate data

Photo 7.--Marketing can be very informal in Jamaica. This fishermen is selling his catch on the beach right by his boat. Karl Aiken

collection systems. Officials estimate that fishing effort more than doubled from 1968-81, even though the fisheries catch was little changed. The process of improving the boats, methods, and gear used by the artisanal fishermen and the increasing use of outboard motors since the 1950s have greatly increased their fishing capacity. Officials believe that coastal waters and inshore banks were fully exploited by the mid-1970s, yet fishing effort has continue to expand. This caused fishermen to expand effort on the offshore Pedro Bank and Morant Cay and by the mid-1980s they were also being overfished. One estimate suggests that catch rates per trap declined by more than 80 percent between 1973-86.[111] Fishery officials have introduced a closed season for lobsters from April to July 1988.

Fishery officials believe that as a consequence of the high level of overfishing, expanded investment in the traditional fisheries will be counter productive. Domestic fishermen already report yields well below optimal levels in a well managed fishery. Some catch increases could be achieved by targeting demersal stocks on the deep fore reef of the oceanic banks.

Officials are planning a major change in fisheries management practices in Jamaica. Officials and researchers have for years been discussing various management options.[112] A FAO consultancy surveyed the major domestic fisheries and provided management recommendations.[113] Fishery officials are reportedly working with the Department of Zoology at the University of the West Indies to develop management measures to help achieve optimal yields. Measures being considered include gear limitations, closed seasons, size limitations, fish sanctuaries, artificial habitats, public education, and catch and effort monitoring.[114] Some studies suggest, for example, that substantial increases in the yield from the trap fishery could be achieved by requiring larger mesh sizes.[115] This would allowing juvenile fish of only limited market value to escape and reach spawning as well as more valuable marketable sizes. Any further increase in the catch may have to come from new pelagic fisheries or by targeting non-traditional resources such as sharks and crabs. FAO also assisted in preparing the new proposed fisheries law.

Officials are hopeful that the new fisheries law, which as of September 2001 had not yet been passed, will make an important difference. Innovations include a new Fisheries Advisory Committee for oversight, involving stakeholders in decision making, infrastructure improvements, regular catch monitoring, upgrading post-harvest handling, and other measures. The main focus will be the prevention of further catch declines and increasing yields.[116]

The FD has completed or is planning several programs to support the management effort. Canada (ICOD) supported a reef management program conducted by the UWI (1989-92). ICOD also help fund a lobster stock assessment project in 1991 which is still ongoing. the DF instituted a conch management plan and with Canadian assistance (CIDA) has initiated a biological study of queen conch to obtain data needed for management measures. The DF in 1993 launched a program to license fishermen. The DF is also working with CFRAMP to develop a program to collect basic fisheries data. This is especially important as Jamaica lacks a permanent system for routinely collecting fisheries data, making it difficult to formulate well conceived basic management decisions. The DF also supports several aquaculture projects.[117]

The FD's ability to manage Jamaican fisheries is severely constrained by personnel and financial limitations. The FD's capital budget in 1993, for example, was J$0.6 million, only 20 percent of the amount requested. The limited budget makes it difficult to attract qualified personnel and, as a result, the agency has found it difficult to address the many pressing problems of the fishing industry.[118]

D. Promotion

The Jamaican Government offers a variety of subsidies to fishermen. The Government provides subsidies on marine fuel, boats, engines, fishing gear and other related supplies. The subsidized fuel is only available to registered fishermen.[119]

E. Longline fisheries

Government officials are concerned about the continuing heavy fishing effort on the demersal reef species that have been the principal fish harvested in Jamaica. Artisanal fishermen currently may return to port with snappers well under 20 centimeters. One alternative is to promote the development of pelagic fisheries. The FD with CFRAMP assistance has sponsored studies to assess the development of both commercial and artisanal longline fisheries.[120] A consultant in 1996 recommended an artisanal swordfish project along the northern coast.[121] This artisanal longline fishery was considered in the late-1990s, but Jamaican officials instead decided to use available Japanese aid to improve facilities at Pedro Bank and provide needed assistance to fishermen at Whitehouse, Westmoreland in western Jamaica.[122]

The authors know of no concrete Government programs currently underway to launch pelagic fisheries. Officials are hopeful that after the planned passing of a new fisheries law, a variety of new initiatives can begin to address the serious difficulties faced by Jamaican fishermen. Officials want to consider options for increasing yields of large pelagic species. Officials also want to reassess the introduction of small-scale longlining.[123]

XIV. Research

Jamaican has one of the more important fishery research establishments in the Caribbean. Given the focus of the fishing industry on coastal species and aquaculture, however, the research establishment has concentrated on the reef fish and shellfish targeted by the fishermen and, in recent years, aquaculture--which is becoming increasingly important in Jamaica.[124] There have, however, been several surveys of oceanic pelagic resources as well as other information compiled by Jamaican and foreign researchers. One Jamaican researcher questions the validity of surveys on highly migratory species claiming with some justification that fishing on these species elsewhere in the Caribbean and Atlantic will affect the abundance off Jamaica.[125]

Some of the research conducted by Jamaican researchers include:

Fisheries Division: The Fisheries Division in the Agriculture Ministry is responsible for fishery statistics, although budget constraints have limited the FD's ability to regularly collect statistics. The FD also conducts some limited research projects. The FD began doing exploratory fishing/training in 1969 with assistance from the UNDP/FAO and has worked independently since 1970. The authors know of no in-house work on swordfish or oceanic pelagics. They have helped fund work on large pelagics by the UWI and private consulting groups. In cooperation with the FD and CARICOM/CFRAMP, a consultant analyzed log-book data of foreign swordfish longliners operating off Jamaica.[126] The FD has given some attention to researching potential new resources and indicates that research has been conducted on the goggle-eye jack and other pelagic resources.[127]

University of the West Indies (UWI): The UWI Mona Campus carries out biological investigations on marine life. Both the Department of Zoology and the

Centre for Marine Sciences has been involved in this work. UWI researchers have primarily focused on the reef fish targeted by Jamaican fishermen. UWI researchers have also prepared some billfish catch data in cooperation with ICCAT. The University has also worked on shore sampling, compiling size frequency and total landings data from the artisanal fishery and catch and effort and size frequency from the recreational fishery.[128] Much of the UWI sampling is conducted at recreational fishing tournaments which are mostly held during the fall.[129] Some limited work is done throughout the year sampling the catch of the artisanal canoe fishermen.[130] Some work has been done on the construction of artificial habitats. UWI researchers have conducted some stock assessments of large pelagics.[131] The UWI in 1990 initiated efforts to headstart sea turtles.[132]

Consultants: A Barbados-based consultant working for the Fisheries Division and CFRAMP has done some work in Jamaica assessing the potential for a commercial longline fishery out of Jamaica. One of the important sources of information for this work was the log book data from foreign fishermen.[133]

Foreign fishermen: Jamaican researchers were impressed with the swordfish catch rates reported by U.S. fishermen operating off Jamaica in 1989-90.[134]

International organizations and foreign researchers have provided some assistance with collecting data needed for research and management.

CARICOM: The Caribbean Community's (CARICOM) Fisheries Resource Assessment and Management Program (CFRAMP) initiated a biological data collection program for large pelagics in 1995.[135] Jamaica continues to participate in that program and to collect data from sport fishing tournaments.[136] CFRAMP has assisted the DF in improving its technical capability.[137]

Colombia: The FD has done some joint research with Colombia through CFRAMP on small Caribbean banks where a joint management regime is in place, Banco Nuevo and Seranilla.

Cuba: Some cooperative fishery research including stock assessment work was conducted with the Cubans during 1977-78. The Cubans developed an important commercial longline fishery in the 1960s, although it was not profitable in a commercial sense.[138] The Cubans reported relatively low catch rates with shark being the predominant species taken in the trials off Jamaica. The major species were dusky, tiger, and reef shark. Other species taken included dorado (dolphinfish), wahoo, yellowfin tuna, blue marlin and other Carangidae species.[139]

FAO: The extensive FAO/UNDP Caribbean Fishery Development survey in 1966-67 assessed pelagic catches with both trolls and longlines. Researchers reported trolling rates over 30 kg per fishing hour on Jamaican banks. South and southwest of Bermuda, barracuda dominated catches, followed by tuna, but catch rates were generally low. FAO deployed a Japanese longliner off Jamaica's northern coast for the longline survey. A 0.4 km mainline was deployed with six branch lines set at 56-m intervals. Researchers reported catch rates of 0.4-1.7 fish per 100 hooks. The species taken included blue and white marlin and bluefin tuna.[140]

ICCAT: The International Commission for the Conservation of Atlantic Tunas (ICCAT) began working with Jamaican officials during the late-1980s as part of the ICCAT Enhanced Research Program for Billfish. Data was collected from artisanal and recreational fishermen to assess blue marlin population trends.[141] Blue marlin is the principal billfish taken by local fishermen. ICCAT is analyzing data from the artisanal fishery and recreational tournaments. ICCAT has provided some funding for this effort.[142]

UM: Researchers at the University of Miami are conducting an extensive study of billfish and swordfish larvae in the Straits of Florida and comparing the larvae there to that obtained in various locations in the Wider-Caribbean, including Jamaica.[143]

VIMS: A researcher at the Virginia Institute of Marine Science (VIMS) worked with a UWI researcher to sample billfish. Much of the work was done seasonally to take advantage of the recreational fishing tournaments during the fall.[144]

USSR: Cooperative fishery research including stock assessment work was conducted with the Soviet Union during 1979-80. A cooperative program was signed in Moscow by Prime Minister Manley on April 11, 1979.[145] Only 2-months later, the Soviet Research vessel *R/V Vihkma* arrived in Kingston on June 12, 1979 to take on Jamaican participants.[146] The Soviets, like the Cubans earlier, conducted trial longline sets in the waters around Jamaica and reported similar results.[147]

Other: One of the earliest studies of pelagic resources was reported in 1963. A researcher reported catch rates of up to 91 kg per year using trolling gear.[148]

Photo 8.--Turtle was a popular item in Jamaican fish shops during the 1960s. Charles Kaufman

XV. Bycatch

As there is no directed Jamaican swordfish fishery, there is no resulting bycatch. Some information is available, however, on the species that would be involved as by catch or directed longline operations. The dominant Caribbean-style pot fishery probably had only a minor impact on the bycatch species assessed in this report. The shift from pot fishing to gillnets on the part of the artisanal fishermen, however, probably has increased the level of interactions. Gillnets are being deployed off the southern coast and are taking sharks. The authors have no details, however, on bycatch rates.

A. Tuna

Jamaica has no commercial longline fishery taking tuna as a directed fishery or bycatch. The artisanal troll fishery does take tuna which is one of the two main targets. There is no detailed time-series data available. Fishermen apparently take about 100 t annually, much of which is yellowfin and blackfin (appendix A3). Stock assessment surveys have also reported bluefin.[149] U.S. fishermen operating around Jamaica in 1989-90 targeted swordfish, but also took tuna--some of which they transhipped through Kingston (appendix B2b). Cuban (1977-78) and Soviet (1979-80) longline surveys conducted in Jamaican waters reported some yellowfin catches, but larger quantities of sharks.[150]

B. Billfish

The authors have little statistical data on billfish. The species most often mentioned in Jamaican sources is blue marlin, but white marlin and sailfish are also present. Artisanal troll fishermen in 1997 report taking about 24 t of marlin annually (appendix A3). ICCAT has not noted a billfish catch, presumably because no data has been available. They did report 24 t of blue marlin, using the CARICOM source on which appendix A3 is based. A small recreational catch would have to be added to get a rough estimate of the total Jamaican catch.

C. Sharks

No time-line data is available on Jamaican shark catches. A U.S. Peace Corp Volunteer in the 1960s worked with a fisherman's cooperative to develop a shark fishery.[151] Cuban and Soviet pelagic resource surveys reported that the bulk of their pelagic catch was shark, primarily dusky, tiger, and reef sharks.[152] Gillnets deployed off the southern coast do take sharks and rays.[153] Jamaican pelagic fishermen deploying troll gear report only a small shark catch in 1997 (appendix A3).

D. Other finfish

About half of the Jamaican catch of larger pelagics is made up of what Jamaican officials refer to as mackerels (appendix A3). No further species breakdown is available, but this would also include wahoo. Almost all of this mackerel is currently being taken by artisanal trolling.[154]

E. Turtles

Four species of sea turtles have been commonly reported in Jamaican waters. The most common is the hawksbill. Other species reported include greens, loggerheads, and occasionally leatherbacks. Turtles nest at isolated Jamaican beaches and offshore cays.

Nesting records exist for hawksbills and leatherbacks.[155] There are also reports of nesting greens.[156] Aerial surveys conducted in 1981-82 showed the largest sea turtle concentrations off the western and southern coasts. At least some turtles, however, were observed off virtually all of Jamaica's 13 parishes (appendix C1).[157]

Turtles have long been seen as an economic resource on Jamaica. The country has a long history of exploiting turtles, both on Jamaica and surrounding waters. In fact, Jamaicans followed turtles moving to Central America and there are today populations of English speaking blacks near Honduran turtle beaches.[158] Jamaicans have viewed turtles as a food source. Hawksbills have the added advantage that their shells can be used for jewelry. Jamaica has not routinely collected fishery statistics and thus data on historic turtle catches are unavailable.

The Jamaican authorities took action in 1955 to control turtle exports.[159] Sea turtles have been protected on Jamaica since 1982. Legal provisions make it an offense to possess a protected animal or parts of such animals, living or dead. Sea turtles can not be killed or even molested nor can the eggs be collected.[160] A separate law exists for fishing on Morant Cay and Pedro Bank and includes provisions protecting turtles and turtle eggs.[161] The Government has very limited resources, however, available to enforce the regulations protecting turtles. Enforcement measures can be a costly undertaking. Government officials believe that poaching and unregulated coastal development are the major threats.

The authors have little information on fishery interactions with turtles. DF officials indicated in 1990 that the greatest threat to turtles was from individual spear fishermen whom his agency does not have the capability of supervising.[162] As in many other Caribbean islands, there is no shrimp trawl fishery affecting turtles.[163] There are, however, incidental catches from other ongoing fishing operations.[164] The authors know of no assessment as to the impact of fishery operations.

Only recently have non-consumptive uses for turtles gained in importance. Few Jamaican tourist brochures advertising diving fail to mention the opportunity to see turtles.[165] There are some indications that interest in conservation is growing in Jamaica. The UWI in 1990 initiated efforts to headstart sea turtles.[166] The authors are unsure to what extent this program was pursued. The National Resources Conservation Authority (NRCA) together with the Sea Turtle Recovery Network (STRN) is developing and has implemented programs to increase public awareness of the need to protect both turtles and their environment.[167] A new protected area, for example, was created in 1999 at Portland Bight where hawksbill and green turtles, as well as seabirds, nest.[168]

It is unclear, however, how strong the conservation ethic is becoming on Jamaica. A declining economy is not a good environment in which a conservation ethic can grow. There was, for example, considerable public opposition to the establishment of the Portland Bight protected area. The serious economic problems faced by the country suggest that many poor Jamaicans, including artisanal fishermen, would not pass up the opportunity to take a turtle or turtle eggs if the opportunity presented itself--especially as enforcement of existing legislation is limited.

F. Marine mammals

A variety of marine mammals have been reported off Jamaica. The NRCD 1981-82 aerial survey reported numerous sightings of bottlenose dolphins, primarily along the shallow southern coast. Manatees were also present.[169] There has even been a stranding of a rare beaked whale.[170] The Sea Education Association planned to use its research vessel, the *R/V Westward* to investigate the shallow area north of Morant Point where large concentrations of cetaceans and seabirds were reported. The research and training cruise was to focus on the reasons for the high productivity in the area.[171] Whale watching appears to be only a minor activity on Jamaica.[172] No information is available on fishery interactions with marine mammals.

G. Seabirds

One comprehensive study of Caribbean seabirds reported that 11 species of seabirds may nest on Jamaica itself. There is also considerable nesting activity on offshore cays and islets, especially Morant Cay and Pedro Bank. Many of the same species that nest on the mainland also nest on the offshore cays, but there may be 6 additional species nesting on the cays (appendix C2).[173]

NRCD workers in 1982 began intensive studies on Morant Cays of Jamaica's two most abundant Larid species, Sooty Tern (*Sterna fuscata*) and Brown Noddy (*Anous stolidus*). The object was to develop a habitat management plan.[174] The authors know of no Jamaican research on the fishery interactions with seabirds. Fishermen are known, however, to have

collected eggs from various cays for sustenance. One Jamaican company, Hill's Deep Sea Fishery, in the 1960s attempted to take booby eggs on distant Serrana Cay.[175] Many of the traditional fishing methods with traps, handlines, and diving, however, would seem to have little or no potential impact on seabirds. Trolling for oceanic pelagics would also have little impact on birds. The expanding use of gillnets, however, is a development which may have some limited impact.

XVI. International

A. International Relations

1. Multilateral

Jamaica has not been active in multilateral organizations working on fisheries

CARICOM: Jamaica is a member of the Caribbean Community (CARICOM) and participates in the Fisheries Resource Assessment and Management Program (CFRAMP). CFRAMP project has sponsored several studies assessing Jamaica's potential for large pelagic fisheries.[176] The CFRAMP program in 2000 was in a phase-over stage, expiring in 2001. It is being replaced with a permanent regional fisheries organization--the Caribbean Regional Fisheries Mechanism (CRFM). CRFM will be composed of the Ministerial Body, a Caribbean Fisheries Technical Unit and the Caribbean Fisheries Forum. CRFM is expected to continue CFRAMP's work. CRFM's mandate, however, is much broader and includes such areas as management of shared resources and representing member countries at international fora.[177]

ICCAT: There have been occasional contacts with the International Commission for the Conservation of Atlantic Tunas (ICCAT). As Jamaica does not have a substantial fishery for the oceanic pelagics covered by ICCAT, Jamaica has not routinely participated in Commission activities. Jamaican officials to date have not expressed an interest in joining ICCAT. A UWI researcher has helped with billfish sampling, an important ICCAT research program.[178]

2. Bilateral

Jamaica has limited bilateral fishery relations. A major focus of Jamaica's foreign fisheries policy has been to gain access to fishing grounds of neighboring countries through bilateral fisheries agreements. The only known agreement is with Colombia.

Foreign fishing in Jamaican waters is limited. After an initial burst of activity in the early 1960s, there has been little foreign activity off Jamaica. The most active country has been Japan. The last reported foreign distant-water fishing off Jamaica was in 1987 (appendix D), although there may have been some limited U.S. fishing since then. The ICCAT 5° square immediately around Jamaica is 1575. Jamaica shares that square with neighboring countries. The foreign swordfish catches below are based on catches in area 1575 (appendix D). The foreign catch data considered here is only swordfish catches. The swordfish catch is for many countries a bycatch of the larger tuna fishery and thus a reflection of overall fishing patterns. Overall catch and effort data have also been analyzed in some detail.[179] Foreign swordfish catches in adjacent ICCAT squares is available in other chapters of this report:

1570: See the Haitian chapter of this report.
1575: This is the ICCAT square which includes Jamaica and almost all of the Jamaican EEZ.
1580: See the Cayman Islands chapter of this report.
2075: See the Cuban chapter of this report.
2080: See the Cuban chapter of this report.

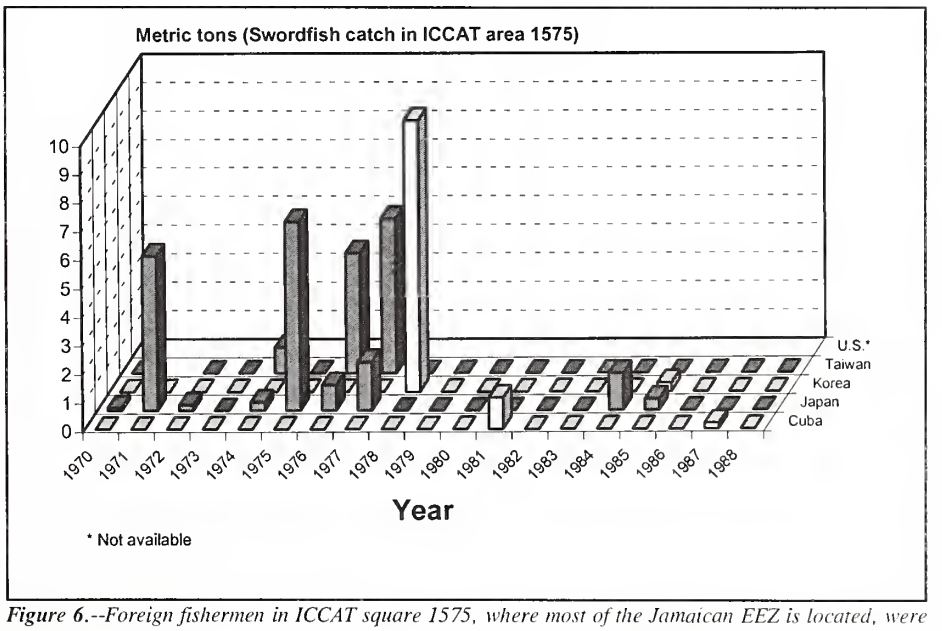

Figure 6.--Foreign fishermen in ICCAT square 1575, where most of the Jamaican EEZ is located, were active in the 1960s and 70s, but little activity has been reported in recent years.

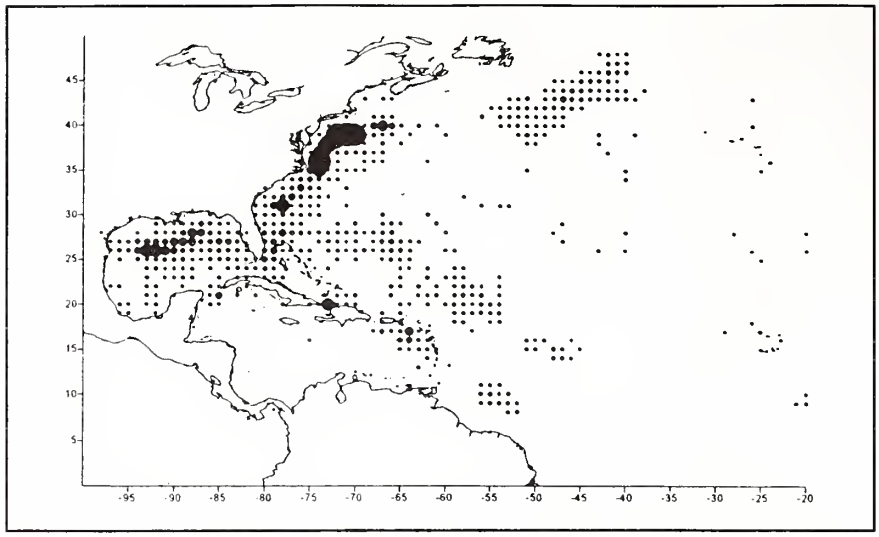

Figure 7.--U.S. fishermen in 1994 reported some sites southeast of Jamaica. In some years, however, there were no sites at all near Jamaica. Cramer

Some of the Jamaica's major bilateral fishery activities are as follows:

Colombia: Jamaica negotiated with Colombia for access to Bajo Nuevo and Serranilla Banks, located well south of the Pedro Bank. The access agreement expired in 1986.[180] It appears to have since been renewed because the DF reported in 1998 that a "joint regime area" with Colombia allows Jamaican fishermen to exploit the Seranilla Banks.[181] Jamaican and Colombian officials are cooperating on efforts to assess the fisheries potential of other remote banks such as Alice Shoal. The Jamaican research vessel *R/V Dolphin* and the Colombian *R/V A.R.C. Providencia* were used in efforts to assess stocks.[182]

Cuba: The authors have limited information on artisanal activity between Cuba and Jamaica, but it appears to be limited. There has also been very limited Cuban commercial longlining in ICCAT square 1575. The limited Cuban swordfish catches reported during 1981 and 1987 could in fact have been in the Cuban part of the ICCAT 5° square (appendix D).

Japan: The distant-water country that has been most active off Jamaica has been Japan. The Japanese first reported swordfish bycatch in 1962 as they expanded their tuna longline fishery. They reported a substantial swordfish bycatch of 4.9 t in 1964. Their largest swordfish bycatch, however, totaled 6.6 t in 1975. The Japanese were especially active in the 1960s and 70s. Japanese fishing was primarily centered on the third quarter of each year. Only limited fishing was reported off Jamaica in the 1980s. The last swordfish bycatches were reported in 1985 (appendix D). More recent Japanese reports have indicated no fishing activity off Jamaica during 1993.[183]

Korea: Korea has reported very limited fishing activity off Jamaica. Some limited activity was reported in 1978 and 1985 (appendix D). While Korean fishing off Jamaica has been limited, the Koreans did report a very large swordfish bycatch of 9.5 t in ICCAT area 1575 during 1978, all taken in the fourth quarter.

Spain: Spanish fishermen in 1993 reported no swordfish fishing off Jamaica.[184]

Taiwan: Taiwan has been active in the eastern

Photo 9.--FAO masterfishermen worked aboard Japanese-built boats to train Jamaican fishermen in the 1960s and 70s. FAO

Caribbean and north of the Caribbean around Bermuda. There has generally been limited Taiwan fishing in the western Caribbean. Taiwan first operated in ICCAT square 1575 during 1968. Some substantial swordfish bycatches were reported in 1976-77. Taiwan reported a swordfish bycatch of 5.4 t in 1977 (appendix D). The Taiwan fishermen exclusively operated in the fourth quarter. There has not, however, been any Taiwan fishing in ICCAT square 1575 since 1977.

United States: The United States began developing a longline fleet targeting yellowfin tuna in the Gulf of Mexico. U.S. longline fishermen began targeting swordfish in the mid-1980s after they excountered a commercially exploitable population off the Florida Atlantic coast.[185] A small number of the swordfish/tuna U.S. longliners are active in the wider-Caribbean, but rarely set south of Cuba or around Jamaica (figure 7). There is some U.S. activity northeast of Jamaica in the Windward Passage between Cuba and Haiti, but this varies greatly from year to year.[186]

B. Joint ventures

There are no Jamaican joint ventures associated with swordfish or other oceanic pelagics. Such ventures are usually associated with export oriented operations and Jamaica does not routinely export these species.

C. Foreign aid

The FAO and several governments have provided fisheries assistance to Jamaica.

Canada: The Canadian International and Development Research Center (IDRC) beginning in 1979 provided assistance with an oyster culture project. The Canadians also helped fund a reef fish improvement project and a fishery management project in the late 1980s. Canadian funding has made possible much of the work carried out by CFRAMP. Trent University in Canada received funding from the Canadian International Development Agency (CIDA) and has worked with the UWI on a fisheries improvement project through 1991.

Cuba: Fishery exchanges with Cuba were strongly promoted after Michael Manly became Prime Minister in 1975. The new prime minister visited Cuba in July 1975 and agreements were reached on cooperative efforts in several areas, including fisheries.[187] A Cuban delegation visited Jamaica in September 1975 to work out details.[188] A Cuban-Jamaican Commission developed exchanges and cooperative efforts. Some Cuban vessels landed fish in Jamaica. The Cubans provided assistance, including exploratory and small scale experimental fishing during 1978-80. The Cuban Government has also provided scholarships in Cuban fishery schools as part of a Cuban-Jamaican Training Program. Jamaicans were trained as ship captains, engineers, electronic technicians, and other skilled workers at the Andres Gonzalez Lines and Alecrin technical schools in Cuba.[189] Cuba also assisted with the construction of ferro-cement boats. The ferro-cement boats did not prove very effective. Cooperation was abruptly terminated after Prime Minister Manly lost the 1980 general election.[190]

FAO: The FAO has provided some fisheries assistance in assessing available resources, gear technologies, training, and other areas. FAO masterfishermen and gear technicians worked in Jamaica during the 1960s.[191] Jamaica participated in the FAO/UNDP Regional Project for the Western Central Atlantic which was completed in 1971. FAO was especially active in Jamaica from 1969-74. Most of the FAO assistance has focused on the artisanal fishery. One FAO project during the 1970s provided training for 36 persons in deepsea fishing.[192] FAO sponsored a coastal zone management project in the early 1990s.[193] FAO also sponsored a review of policy issues in important Jamaican fisheries during 1996.[194]

Germany: Germany in the late 1970s funded the construction of a ship repair and fisheries marketing facility in Kingston. They also provided some model troll boats.[195]

IDB: The Inter-American Development Bank (IDB) was extremely active in the 1970s and sponsored several large fishery development projects in Latin America. The IDB announced a feasibility study in 1976.[196] IDB funds were used in training for offshore fisheries and fishing surveys.[197]

Japan: Officials in the late 1990s were considering using Japanese assistance funds for an artisanal longline proposal for the north coast, but instead went ahead with a project to build facilities for the fishermen at Pedro Cay and Whitehouse, Westmoreland.[198] The Japanese Government in 1998 initiated a development program which involved constructing piers and cold stores, and providing assistance to fishermen of two parishes in western Jamaica.[199]

Netherlands: The Dutch Government provided training in evaluating trap fishing resources on the Pedro Bank during 1978-80.

Soviet Union: The Soviets provided fisheries assistance during the premiership of Michael Manly (1975-80). Prime Minister Manley signed a fisheries agreement with the Soviet Union on April 11, 1979 during a trip to Moscow. The Soviets offered to provide resource assessments and training in exchange for the Jamaicans servicing their fishing vessels.[200] While the Soviets did conduct resource assessments, the authors know of no Soviet fishing vessels serviced in Jamaica. This was in part because of the limited

capability of Jamaican shipyards. Plans to acquire a floating drydock never materialized.[201] The exploratory work was conducted as part of USSR/GOJ Cooperative Research Fishing Project. The first activity was a trawling survey on Pedro Bank during 1979-80. A second project in 1980 involved a Soviet research vessel assessing the potential for pelagic longlining. The Manly Government was considering a drydock project with the Soviets. As with Cuba, such cooperation was abruptly ended when Prime Minister Manly was defeated in the 1980 general election.[202]

United States: U.S. Peace Corps volunteers have worked with both marine fisheries and aquaculture. The U.S. Government has assisted with aquaculture. Much of the work was conducted beginning in 1977 through Auburn University and focused on tilapia and grass carp. The program was renewed in 1980.[203] This has been a particularly important area as it has allowed Jamaica to increase fisheries production without further stressing already heavily fished resources. Jamaica's aquaculture industry is now one of the largest in the Caribbean and supplies both domestic and export markets.

XVII. Enforcement

Jamaica has limited enforcement capabilities. The country in the 1980s had some larger patrol boats (26 and 32 m) for offshore patrols. They also had several 9-m police boats for inshore patrols. Fisheries enforcement, however, has not been the primary at sea task.

Scattered fishery incidents have been reported with neighboring countries. The authors know of no longline seizures.

Colombia: Colombian authorities seized two Jamaican fishing boats (*Dolphin* and *Gabriella*) and arrested the 16-member crews in June 1981. The *Dolphin* was owned by the Fisheries Division. The seizure occurred while a Jamaican Government delegation was in Colombia discussing possible fisheries cooperation and access arrangements. The fishermen were fined J$1,000 each.[204] Jamaican fishermen in 1988 complained that Colombian fishermen were operating on the Pedro Bank. They expressed concern because of the larger sizes of the Colombian vessels and the fact that some of the fishermen on these vessels were armed.[205]

Dominican Republic: The JDF on May 22, 1986 seized a Dominican mother boat and eight catcher boats and arrested 32 Dominican fishermen who were fishing

Photo 10.--This 26-m Jamaican patrol boat was used for offshore patrols in the 1980s. Charles Fuss

with out a license for lobster on the Pedro Bank. The fishermen and officers of the boat were fined J$8,400 and the vessel, gear, and equipment were confiscated.[206]

Honduras: As with several other Caribbean countries, the most common incidents are reported with Honduran fishermen. There are also occasional Honduran seizures of Jamaican fishermen. The Honduran Navy seized the Jamaican fishing boat *Epco IV* near Guanaja Island. There was 5.9 t of fish found aboard. The owner of the boat was fined $5,000.[207] The Jamaican Coast Guard (JCG) in September 1981 arrested 44 Honduran fishermen aboard the mother ship *Apollo*, a U.S. registered shrimp trawler. The Hondurans were fishing about 1 km northeast of Morant Cay. The JCG in 1982 arrested 88 Honduran fishermen, including boys as young as 9 years old, fishing without a license on the Pedro Bank, south of Jamaica. Lobster and turtle meat was found aboard the Honduran boats. The Hondurans were aboard the mother boats *Captain Cholo, Don José,* and a third unnamed boat which sank. The 40 man crew of the sunken boat were rescued. Jamaican authorities decided to only prosecute the captains and officers because many of the fishermen had no idea where they were and did not know that they were violating Jamaican law. Small fines of J$50-400 were assessed.[208] The JDF in November 1985 arrested 46 Honduran fishermen. The fishermen were seized about 15 km northeast of the Pedro Bank.[209] Jamaican fishermen in 1988 complained that Honduran fishermen were also operating on the Pedro Bank. They expressed concern because of the larger sizes of the Honduran vessels and the fact that some of the fishermen on these vessels were armed.[210] The Jamaican Defense Force (JDF) in 1991 arrested more than 100 Honduran fishermen fishing illegally on the Pedro Bank. The JDF seized 8.8 t of conch and 0.1 t of lobster on the two motherships from which the fishermen were operating. One of the vessels had sailed from the Cayman Islands.[211] A fine of J$29,000 was imposed and the catch and fishing equipment was confiscated. The equipment was diving equipment.[212]

Nicaragua: Nicaraguan authorities arrested 12 Jamaican fishermen in June 1977. Nicaraguan authorities claimed that the Jamaicans were part of a "pirate fleet" that had been routinely poaching in Nicaraguan waters. The Jamaicans were arrested when their boat ran aground near Puerto Cabezas.[213]

Unknown: The JDF seized a 14-m fishing boat off the Galina coast in 1986. Four Cuban Americans were aboard the vessel.[214]

XVIII. Future Trends

Jamaica has one of the most heavily exploited fisheries in the Caribbean. There is little potential for significantly increasing the demersal catch, although a well-conceived management program could improve both catches and yields. Jamaica will need to expand the currently small pelagic fishery to increase its fisheries catch significantly. Foreign fishermen have demonstrated that swordfish and other oceanic pelagics can be taken off Jamaica. While catch rates were not particularly notable, they were higher than Jamaican officials had anticipated and probably could support a small domestic longline fishery. An attempt to launch a small swordfish longline fishery in 1989 failed. The Government has subsequently sponsored some studies on large pelagic populations and feasibility studies on longlining. An artisanal longline fishery for oceanic pelagics was considered in the mid-1990s, but Jamaican officials decided to use available Japanese aid to improve facilities at Pedro Bank and at sites in western Jamaica. Jamaican fishermen do not currently operate either artisanal or commercial longliners for pelagic species and the authors have noted no effort to acquire any. Fisheries officials have continued to express some interest in promoting pelagic longlining, but currently are more concerned with gear like gillnets that are commonly in use.

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Appendices

Series A: Catch data
Series B: Trade data
Series C: Bycatch species
Series D: Foreign fishing

Appendix A1.--Jamaica. Fisheries catch, 1980-98

Year	Catch
	Metric tons
1980	9,050
1981	7,788*
1982	7,870
1983	8,653
1984	9,631
1985	10,216
1986	10,496
1987	9,145
1988	7,863
1989	8,875
1990	8,822F
1991	8,920F
1992	9,520F
1993	10,145F
1994	10,490F
1995	10,537F
1996	12,843*
1997	8,358
1998	6,720

F - FAO estimate
* Government officials report that actual surveys of Jamiacan catches were conducted in 1981 and 1996. The data posted here from 1982-1995 are only rough estimates. The actual catch quantities reported by the Fisheries Division (FD) are different from the FAO data noted here. (The FAO relies on national fishery agencies like the FD for its data.) The FD reported 7,220 t in 1981 and 14,000 t in 1996. K. Aiken and G.A. Kong, "The marine fisheries of Jamaica," *Naga*, January-March 2000, p. 33.
Source: FAO, *Yearbook of Fishery Statistics*, (FAO: Rome, various years).

Appendix A2.--Jamaica. Swordfish catches, 1985-98

Year	Catch			U.S.	
	JDF**	FAO#	ICCAT##	Catch*	Imports*
			Metric tons		
1985		NA	NA	-	-
1986		NA	NA	-	-
1987		NA	NA	-	-
1988		NA	NA	-	-
1989		NA	NA	-	-
1990		NA	NA	20.8	3.9
1991		NA	NA	-	-
1992		NA	NA	-	-
1993		NA	NA	-	-
1994		NA	NA	-	-
1995		NA	NA	-	-
1996		NA	NA	-	-
1997	-	NA	NA	-	-
1998		NA	NA	-	-
1999		NA	NA	-	-
2000		NA	NA	-	-

* Converted to live weight using a conversion factor of 1.4.
** In some cases provided by CARICOM.
# Marine fish are not broken down by species
ICCAT does not list Jamaican data
Note: Discrepancies with appendix ? are unexplained.
Source: CARICOM, "Report of the CARICOM Resource Assesment and Management Program (CFRAMP)," (SCRS/98/102) (GDF data); *Yearbook of Fishery Statistics*, various years (FAO data); ICCAT, *Statistical Bulletin*, various years and various ICCAT-SCRS relaeases (ICCAT data); NMFS Southeast Fisheries Center (U.S. catch data); and U.S. Bureau of the Census (U.S. Import data).

Appendix A3.--Jaimaica. Pelagic catch, 1997

Species	Catch 1997
	Metric tons
Tunas	119.9P*
Mackerels	155.3P
Marlins	23.5P
Sharks	1.3P

P - Preliminary
* Includes yellowfin, skipjack, bonito, and blackfin.
Source: CARICOM, "Report of the CARICOM Fisheries Resource Assessment and Management Program (CFRAMP)" (SCRS/98/102).

Appendix B1.--Jamaica. Swordfish exports by destination, 1990-99

Destination	Year										
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	Metric tons										
United States	3	-	-	-	-	-	-	-	-	-	-
Japan	-	-	-	-	-	-	-	-	-	-	NA
European Union	NA	-	-	-	-	-	-	-	-	-	NA
Others*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total	NA	-	-	-	-	-	-	-	-	-	NA

* Swordfish shipments to other countries are believed to be non-existent or negligible
Source: Various

Appendix B2a1.--United States. Swordfish imports from Jamaica, 1975-2000

Year	Commodity		Total*
	Fresh	Frozen	
	Metric tons		
1975	-	-	-
1976	-	-	-
1977	-	-	-
1978	-	-	-
1979	-	-	-
1980	-	-	-
1981	-	-	-
1982	-	-	-
1983	-	-	-
1984	-	-	-
1985	-	-	-
1986	-	-	-
1987	-	-	-
1988	-	-	-
1989**	-	-	-
1990	2.7	-	2.7
1991	-	-	-
1992	-	-	-
1993	-	-	-
1994	-	-	-
1995	-	-	-
1996	-	-	-
1997	-	-	-
1998	-	-	-
1999	-	-	-
2000	-	-	-

* Totals may not agree due to rounding.
** Included Turks and Caicos Islands until 1989.
Source: U.S. Census Bureau

Appendix B2a2.--United States. Swordfish imports from Jamaica 1975-99

Year	Commodity		Total*
	Fresh	Frozen	
	US$1,000		
1975	-	-	-
1976	-	-	-
1977	-	-	-
1978	-	-	-
1979	-	-	-
1980	-	-	-
1981	-	-	-
1982	-	-	-
1983	-	-	-
1984	-	-	-
1985	-	-	-
1986	-	-	-
1987	-	-	-
1988	-	-	-
1989**	-	-	-
1990	20	-	20
1991	-	-	-
1992	-	-	-
1993	-	-	-
1994	-	-	-
1995	-	-	-
1996	-	-	-
1997	-	-	-
1998	-	-	-
1999	-	-	-
2000	-	-	-

* Totals may not agree due to rounding
** Included Turks and Caicos Islands until 1989.
Source: U.S. Census Bureau

Appendix B2b.--United States. Tuna imports from Jamaica, 1990-2000

Year	Product	Imports	
		Quantity	Value
		Metric tons	$US1,000
1990	Fresh unspecified	26.6	197.7
1991		-	-
1992		-	-
1993	Fresh yellowfin	2.1	2.6
1994		-	-
1995		-	-
1996	Fresh unspecified	0.9	6.5
1997		-	-
1998		-	-
1999		-	-
2000		-	-

Souce: U.S. Census Bureau

Appendix B2c.--United States. Fishery imports from Jamaica, 1999-2000

Product	Year 1999	Year 2000
	US$1,000	
Fish		
Freshwater		
Tilapia fillet		
Fresh	1,122	1,206
Frozen	187	87
Other, fresh	72	54
Marine		
Herring kippered	4	-
Snapper	-	3
Other		
Fresh	8	11
Frozen	-	14
Shellfish		
Crustaceans		
Lobster	6,361	6,678
Crab	-	9
Other		
Frozen	151	-
Other	62	-
Mollusks		
Conch		
Live/fresh	4,049	45
Other, canned	605	-
Other		
Sauces	24	27
Soups	13	4
Sticks	29	23
Total*	12,686	8,159

* Totals may not agree due to rounding.
Source: U.S. Census Bureau

Appendix B2d.--United States. Fishery exports from Jamiaca, 1990-2000

Year	Imports Quantity	Imports Value
	Metric tons	US$1,000
1990	868	3,224
1991	1,185	5,984
1992	887	5,907
1993	1,573	6,503
1994	1,417	9,910
1995	1,415	11,489
1996	1,634	10,512
1997	1,305	8,216
1998	1,812	11,002
1999	1,599	12,686
2000	486	8,159

Source: U.S. Census Bureau

Appendix C1.--Jamaica. Turtles and whales observed by aerial surveys, 1981-82

Parish	Animal		
	Manatees	Dolphins	Turtles
		Number	
North			
St. James	-	-	4
Trelawny	-	-	4
St. Ann	1	-	6
St. Mary	-	4	7
East			
Portland	-	-	8
St. Thomas	2	-	15
South			
St. Andrew	-	-	-
St. Catherine	15	46	463
Clarendon	9	21	22
Manchester	15	1	12
St. Elizabeth	37	86	11
West			
Westmoreland	-	-	21
Hanover	-	-	25
Total	79	158	598

Source: P.W. Fairbairn and A.M. Haynes, "Jamaican surveys of the west Indian manatee (Trichechus manatus), dolphin (*Tursiops truncatus*), sea turtles (families Cheloniidae and Dermochelydae) and booby terns (family Laridae)," source unavailable, probably published in 1983. Both authors were staff of the Jamiacan National Resources Conservation Department.

Appendix C2.--Jamaica. Seabird nesting, 1984

Area	Information	Species*	Known** threats	Importance***
Mainland	Reasonable	2?, 5?, 6, 7, 11, 12, 13, 16, 18, 20, 22	Ex?, Pr, Ha, Po	Important
Morant Cay	Poor	5?, 7?, 12, 13, 18, 19, 22	Ex	Important
Pedro Bank	Poor	5?, 7?, 9?, 10, 12?, 13?, 14?, 16?, 18?, 19, 22	Ex	Important?

* Species: 2 - Pterodroma h. caribbaea; 5 - Phaethon aethereus; 6 - P. lepturus; 7 - Fregata magnificens; 9 - S. sula; 10 - Sula leucogaster; 11 - Pelecanus occidentalis; 12 - Larus atricilla; 13 - Sterna maxima, 14 - S. sandvicensis acuflavida; 16 - S. dougallii; 18 -S. anaethetus; 19 - S. fuscata; 20 - S. (albifrons) antillarum; 22 - A. stolidus

** Threats: Ex - exploitation of eggs, young or adults; Pr - predators, generally introduced mammals; Ha - habitat destruction or disturbances; Po - pollution; Fi - fisheries

*** A rough subjective rating of relative importance of area for breeding seabirds.

Source: Ruud van Halewyn and Robert L. Norton, "The status and conservation of seabirds in the Caribbean," in J.P. Croxall, P.G.H. Evans, and R.W. Schreiber (eds.), "Status and conservation of the world's seabirds," *ICBP Technical Publication*, No. 2 (ICBP: Cambridge, 1984), pp. 175-176.

Appendix D.--ICCAT square 1575. Foreign swordfish catches by country and quarter, 1959-97

ICCAT Square*	Year	Quarter 1	2	3	4	Total
		Metric tons				
Cuba	1981			1.0	0.1	1.1
	1987			0.2		0.2
Japan	1962		-	0.1		0.1
	1963			0.3	0.8	1.1
	1964	0.4		2.8	1.7	4.9
	1965		0.2	0.4	1.8	2.4
	1966			3.1		3.1
	1967			0.3		0.3
	1968			0.4		0.4
	1969			0.9		0.9
	1970			0.1		0.1
	1971	0.3		1.7	3.4	5.4
	1972	0.1		0.1		0.2
	1974			0.3		0.3
	1975			6.6		6.6
	1976	0.1	0.1	0.7		0.9
	1977				1.7	1.7
	1984	0.4	0.9			1.3
	1985				0.4	0.4
Korea	1978				9.5	9.5
	1985			0.3		0.3
Spain		No Spanish fishing reported				
Taiwan	1968				1.1	1.1
	1974				0.9	0.9
	1976				4.2	4.2
	1977				5.4	5.4
United States		U.S. fishing data unavailable**				

* ICCAT square are 5° degree squares of latitude and longitude. The first two numbers are the latitude and the second two numbers are the longitude. This represents the southeastern corner of the 5° square for catches in quadrant 4, northwest Atlantic.

** The authors encountered apparent statistical problems with the U.S. data on the ICCAT web site. Apparently ICCAT is in the process of recalculating the 1° square data by 5° squares. As a result this data was not added to this appendix.

Source: ICCAT: http://www.iccat/es/Stats.html, retrieved July 3, 2000

15

MARTINIQUE

by William B. Folsom

Martinique is an island in the lesser Antilles chain located in the Caribbean Sea. It is part of Metropolitan France and is known for its natural beauty. Fishing plays only a minimal role in the country's economy and imports are needed to meet the local demand, greatly augmented by the tourist trade, for seafood. Most of the nation's fisheries are artisanal, based on small wooden canoes or boats. The existence of swordfish has been confirmed by French scientists who caught 44 juvenile male swordfish during a two-year research cruise. There have been some conflicting reports about the development of the fishery in the past few years. Some scientists claim that there really is no swordfish fisheries in Martinique, while others believe that swordfish is being targeted and that additional catches could be made if improvements to fishing gear and vessels are made. Artisanal fishermen do use longlines and currently catch tunas and other pelagic species, including some swordfish. In any event, it is unlikely that there will be a modern commercial fishery for swordfish, since French authorities are obliged to follow international guidelines designed to manage Atlantic swordfish stocks. If development of the swordfish fishery has taken place -- or will in the future -- it is likely to be restricted to small-scale, artisanal fishermen using a variety of longlines.

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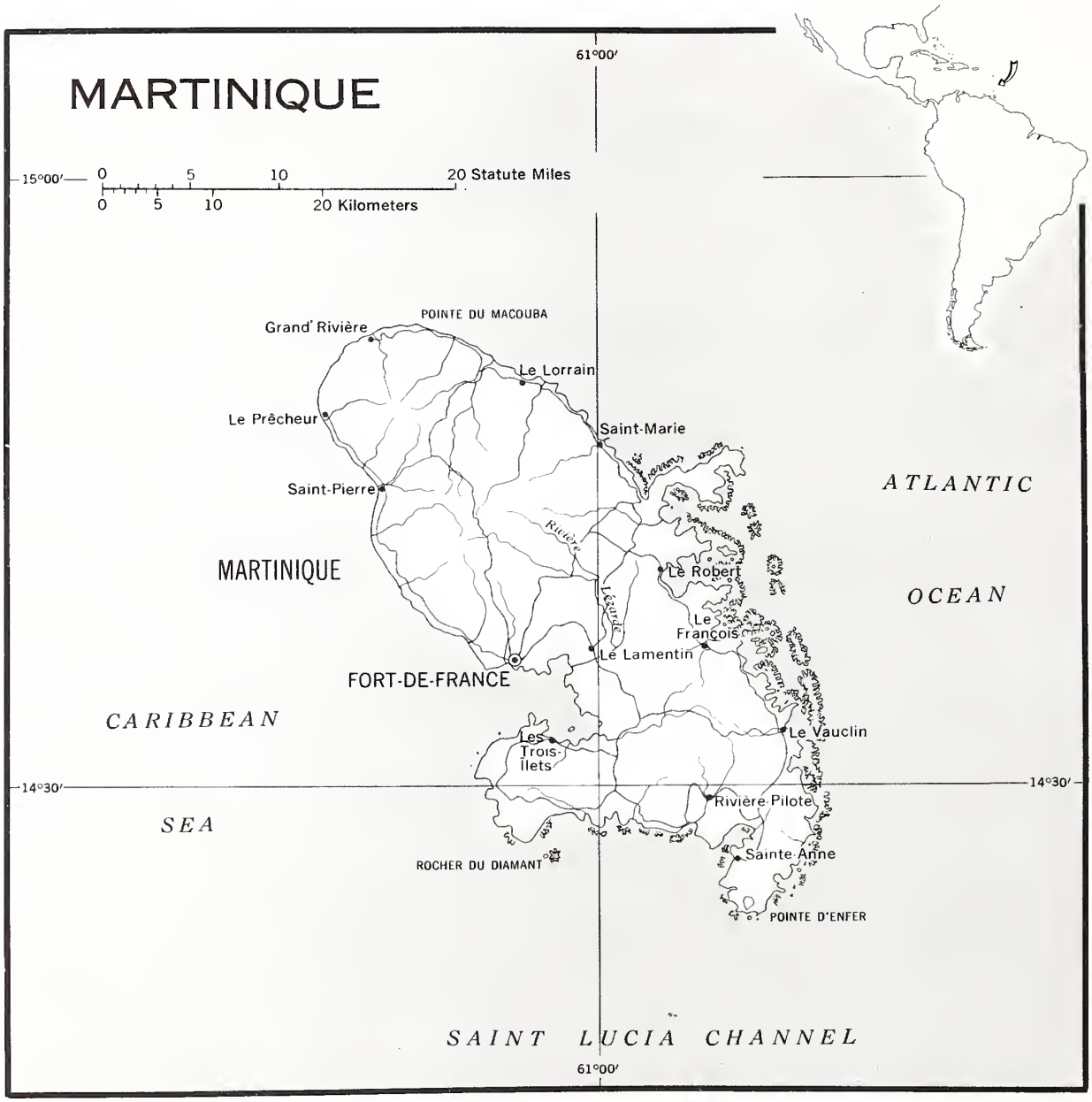

Figure 1.--Map of Guadeloupe, Dominica, and Martinique.

I. Overview

A. History

The name "Martinique" is derived from a Carib Indian word *Madinina* meaning "Island of Flowers." Christopher Columbus sighted Martinique in 1493, but did not land until 1502 during his last voyage. Columbus named the island *Martinica* after Saint Martin. French settlers began arriving in 1635. They began cultivating sugar cane using imported slave labor. In 1762, the English occupied the island, but relinquished their claim in 1763 in exchange for Canada. The British again invaded the island in 1794 and held it until 1815 when it was turned over to France permanently. Martinique remained a French colony until it was made an Overseas Department of France in 1946. The island was made an administrative region in 1974. The French Government is represented by an appointed Commissioner. Local government consists of a popularly elected General Council and Regional Council. Martinique is represented in the French National Assembly.

Martinique suffered one of the most devastating explosions in the history of the Caribbean when Mont Pelée erupted on March 8, 1902, incinerating the city of St. Pierre and killing all but one of its 30,000 inhabitants. As a result, the capital of the island was moved to Fort-de-France.

B. Fishing industry

Martinique is one of the most densely populated of the small Caribbean islands. It had a population of 327,713 on January 1, 1985. The unemployment rate is extremely high. It was approximately 30-percent in 1982. Despite high unemployment, few were seeking to become fishermen, however, and many fishermen were looking for jobs elsewhere. Over exploitation of coastal stocks was having an increasingly negative impact on the livelihoods of local fishermen.[1] About 3 percent of the island's population make their livelihood as fishermen or in support industries.[2] Increasing attention is being given to aquaculture as a alternative to the capture fisheries. One species of special interest on Martinique is red drum.[3]

The population of registered fishermen has remained fairly constant. There were 1,045 fishermen in Martinique in 1960. The number of registered fishermen peaked at 1,765 in 1970 and then began to decline.[4] By 1990, the number of fishermen was 1,274 out of a total population of 118,000.[5] Authorities report that in 1999 there were 965 full time fishermen. There are probably two to three times as many part time or men who fish occasionally, especially during "la miquelon," during November through June the peak pelagic fishing season when the fishermen fish further offshore than normal.[6] Fishing accounts for only a minor part of the nation's economy, well below agriculture and tourism.[7]

C. Geography

Martinique is located in the Lesser Antilles, the island chain that extends from Puerto Rico south to Trinidad and Tobago in the eastern edge of the Caribbean Sea. Martinique is situated between Dominica to the north and St. Lucia to the south. It is the northern most of the Windward Islands.

This volcanic island is characterized by an indented coastline and mountainous terrain. The highest point is Mt. Pelée which reaches 4,650 feet in altitude. This island consists of 1,080 square kilometers (km or 425 square miles which is about half the size of Rhode Island). The capital is Fort-de-France which boats a population of 100,000 inhabitants.

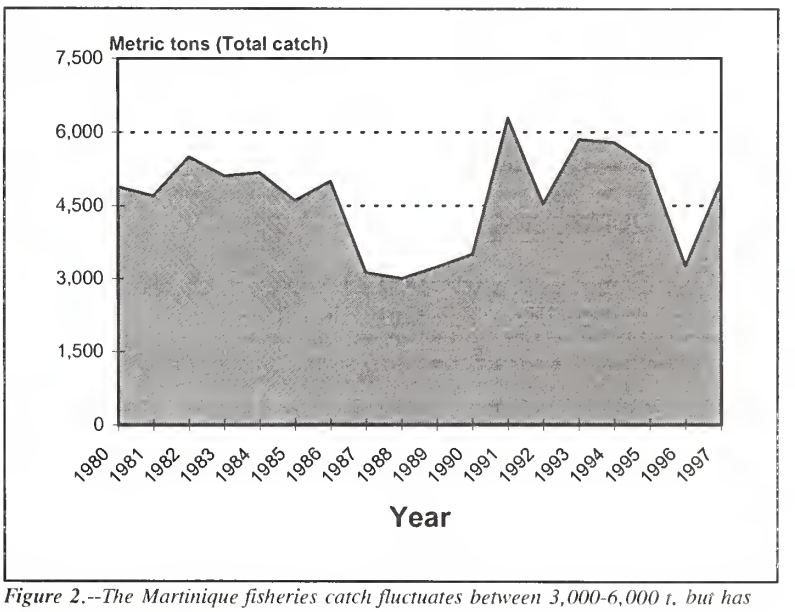

Figure 2.--The Martinique fisheries catch fluctuates between 3,000-6,000 t, but has changed little since 1980.

II. Species

A. General

Species commonly caught by Martinique's fishermen include dorado[8] (*Coryphaena hippurus*), herrings (*clupeoidei*), Atlantic bonito (*Sarda sarda*), Cero (*Scomberomorus regalis*), Blackfin tuna (*Thunnus atlanticus*), skayes, rays, mantas, and sharks (*Rajiformes* and *Elasmobranchii*), and various other reef-fish. Caribbean spiny lobster (*Panulirus argus*) and sea urchins (*Strongylocentrotus spp*) are also harvested. Sea turtles were caught as late as 1992.[9] Very small quantities of freshwater fish and giant river prawns are also harvested.

B. Swordfish

Swordfish are found in the waters surrounding Martinique. The Institute Francaise Scientific de Researche (IFREMER) conducted a 2-year experimental longline fishing between October 1995 and October 1997. The IFREMER scientists caught 44 immature male swordfish.[10] This serves as conclusive proof that swordfish -- albeit mostly males -- are found in the waters off Martinique.

Alain Guillou and Alain Lagin of IFREMER subsequently reported to the 51st Annual Meeting of the Gulf and Caribbean Fisheries Institute in November 1998, that swordfish ("vare" or "vare-sindou" in the local vernacular) was one of the "Main large pelagic fishes targeted by fishermen in Martinique."[11] L. Reynal, a Delegue with IFREMER, reported in a letter written to NOAA researchers in March 2000, that "swordfish is not fished in the French Antilles..."[12] (appendix B).

While these species are abundant further offshore waters and are targeted by foreign fishermen, few Martinique fishermen are able to utilize these pelagic resources. The harvest of billfish is a small part of the overall catch and swordfish is not included in Martinique's report to the Food and Agriculture Organization (FAO) for use in their annual yearbook.

The authors conclude that, although some local fishermen target swordfish using various drifting longlines, the catch probably is only minimal and probably consists mostly of immature males. Swordfish is not considered by most sources in Martinique as particularly important. The development of new longline gear and larger vessels may, however, result in increased landings in the future.

III. Grounds

A. Topography

Martinique is one of the larger islands of the Lesser Antilles. The island has rugged volcanic mountains, raging rivers, and lush tropical rain forests. It is similar in many respects to the neighboring islands of St. Lucia and Dominica. Martinique has a narrow shelf, but relatively large in comparison to neighboring island. The 200 meter (m) line stretches offshore for an average of only three kilometers (km). The sea floor then plunges sharply down to 1,000 m and then to depths of over 3,000 meters. Two shallow water banks are located to the north and northeast between Martinique and Dominica. Both are heavily fished.

B. Oceanography

NOAA during 1991-94 conducted 10 cruises during different seasons to assess the current structure and watermass properties in the southern passages between the Caribbean and Atlantic from Dominica south to Trinidad.[13] Venezuelan researchers report that the main inflow into the Caribbean occurs between Dominican, to the North of Martinique, and St. Vincent (21.5 Sverdrups).[14] Other researchers report stronger current flow more to the south (Caribbean Overview, appendix B1).[15]

C. Fishing grounds

Most local fishermen are only able to fish close to the surface. The few fishermen with larger boats and longline gear that fish further offshore are able to catch dorado, bonitos, tunas, and other pelagic species, including some swordfish.

Photo 1.--Two wooden "yoles" (dories) are moored here in the port of Robert. IFREMER

French officials are now studying how to modernize the fleet. They are looking at larger vessels equipped with more powerful diesel engines. The absence of fishing access agreements with neighboring Caribbean islands makes any major expansion of the fleet difficult.[21]

IV. Fleet

Martinique currently has no commercial longliners.[16] A few artisanal fishermen, however, deploy longlines from their small craft. As is typical with many Caribbean island fisheries, the backbone of the fishing fleet is the dugout canoe. In Martinique, canoes are called *gommiers* after the gum tree from which the canoe was traditionally carved. Gommiers are 7-10 m in length. This canoe has served Carib Indians for hundreds of years and until recently was virtually the only type of craft used by most fishermen. The canoe has a few planks and a sail.[17] In recent years outboard motors have been added to the fleet. Some of these outboards include 65 horsepower (hp) engines.[18] Larger vessels (called *yoles*) were added to the fleet beginning in 1970. In 1980 there were 946 *gommiers* registered in Martinique. In 1986, a total of 1,931 canoes were registered with French authorities in Fort-de-France; this numbers is thought to include the coastal fleet of vessels called *yoles*.[19]

There are three basic types of fishing boats used by Martiniques's small scale artisanal fishermen:
Yoles: Fiberglass yoles are primarily used in the inshore day fishery. Most yoles are small open 6-8 m dories equipped with outboard motors.
Coastal vessels: About fifteen 10-13 m vessels in 1998 were deployed in the coastal fishery.
Deep-water boats: About 5 boats longer than 18-m are used for deep-water fishing.[20]

V. Shipyards

There was only one shipyard able to work with fiberglass in Martinique in 1980. This is believed to be the Thelamon & Dracius Shipyard. A more recent report indicates that two additional companies were active in the 1990s. The Caribbean Fiber Reinforced Plastic Boat company built the small 9-m longliner, the *Caribbean Flag*, which is being used as a training vessel.[22] The Continental Marine company also builds fiberglass boats.[23] These companies also sell fiberglass pirogues to artisanal fishermen on neighboring islands, however, the fishermen complain that the prices are relatively high.[24] One factor are high French tax rates on Martinique which substantially add to production costs.[25]

Most work on wooden canoes is done on the beach by the fishermen themselves or by individuals or family members specializing in the building or repair of canoes.[26] Canoes are also imported from Saint Lucia or Dominica.

The SOCALTRA shipyard was able to work with heavier boats and could repair outboard and inboard diesel engines. It is likely that new shipyards have evolved since 1980.[27]

VI. Fleet Operations and Gear

A. Fleet

Martinique until the late 1980s had one of the most active artisanal fleets in the eastern Caribbean, consisting of about 1,000 vessels in 2000.[28] Martinique fishermen might venture up to 100 km offshore, further than was the case for most artisanal fishermen on other eastern Caribbean islands. The Martinique fishermen in their offshore fisheries were targeting tuna (skipjack and yellowfin) and dorado as well as some smaller pelagics.[29] The larger oceanic species were not heavily targeted by fishermen on most other islands. Only in the late 1980s did fishermen on other islands begin to aggressively target offshore oceanic pelagics.

Although most artisanal fishermen stay fairly close to shore, some have sailed well offshore to fish for pelagic fish in the Guadeloupe Passage between Martinique and Dominica in the north and in the St. Lucia Channel and Saint Lucia to the south. This is sometimes more than 110 km – or 3 days sailing -- from their home ports. This fishery takes place between January and June of each year and is known by the term "Miquelon".[30] The term *Miquelon* comes from the French island of St. Pierre and Miquelon off the coast of Atlantic Canada. It simply refers to a very distant place...or fishery.[31]

Canoe fleet: Canoe fishermen usually fish within sight of land, no more than about 30 km out to sea. Nightfall comes quickly and heavy surf makes returning to port dangerous in poor light. Canoe fishermen typically use trolling lines while heading out to the fishing grounds in the hopes of catching dorado or tuna. When they reach a suitable area, they use a line tied to a rock to serve as an anchor. Gang hooks with pieces of halfbeaks (called *balao*) are used as bait. The lines are lowered to a depth of about 90 meters. Redfish are prized catches. Sharks cause problems for fishermen by eating fish that have been caught.[32] These canoes are usually operated by two to three fishermen.[33]

Coastal fleet: A small fleet of coastal vessel (called *yoles*) also operates in Martinique. These are based on a European design. A number of fibre-glass *yoles* were build during the Third Fisheries Development Plan. These vessels generally operate along the Atlantic coast of Martinique. There were 630 wooden and 75 fiberglass hulled *yoles* operating in Martinique in 1980.[34] These 8-m vessels were able to fish several hundred kilometers to the north of Martinique, between Saint-Barthélemy and Anguilla, and Guadeloupe to the north of Dominica.[35]

Offshore fleet: A 1983 report indicated that four offshore vessels, ranging in size from 8 to 12 m, were operating out of Fort-de-France, Martinique. There were two vessels with a mixed crew of French and Venezuelans that had access to Venezuelan waters. Two other vessels fished between the island of Saint Vincent in the south and Saint Martin to the north of Martinique.[36] The vessels were in the 25- to 50-ton class.[37] A 1986 report indicated that there were seven vessels in the 10- to 25-ton class registered in Martinique's fisheries.[38] These vessels operate with a crew of four and can stay out for up to a week at a time.[39] Another source reported a new 12-m longliner, which can be rigged for other fisheries, under going trials in 1999.[40]

Photo 2.--Martinique fishermen use traditional Caribbean nasca traps like these on Cosmny Beach. They are set at depths up to 80 m along the coast. IFREMER

B. Operations

There are three basic fisheries conducted by Martiniques's small scale artisanal fishermen:
Inshore: The inshore is conducted with yoles up to 5-6 miles offshore, mostly during the day.
Coastal: The coastal fishery is conducted by fishermen during 24-96 hour trips.
Deep-water: A few large boats are deployed in deep-water at considerable distance from Martinique. The primary grounds are in the Guianas Banks, but the deep-water vessels also fish off Haiti, Venezuela, Guadeloupe, and other Caribbean islands. These boats are used for trips longer than 96 hours. These fishermen complain about competition from Venezuelan fishermen who also fish on the Guianas Bank, but deliver their catch to Martinique at low prices (15-20 French francs per kilogram (Fr/kg). The Martinique fishermen, on the other hand, offer their catch dockside for much higher prices (50 Fr/kg).[41]

C. Gear

Martinique's fishermen employ a wide variety of gear, including troll lines, surface nets (for small fish), surrounding nets, bottom lines, and beach seines. Fishermen also dive for conch, sea urchins, and crustaceans.[42]

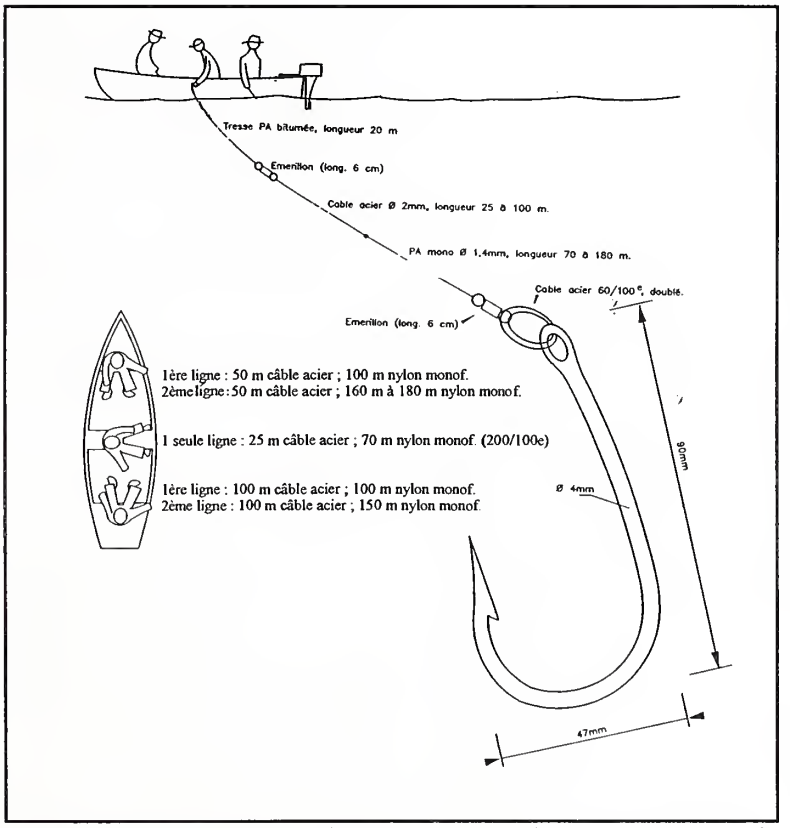

Figure 3.--This drift longliner gear is used to catch swordfish and other large pelagics in Martinique. Guillou and Lagin, IFREMER

Beach seines: This gear is used along the northern Caribbean coast. Its use has declined in recent years. If not used properly, beach seines can take large numbers of juveniles thus impairing the overall catch.
Deep-water lines: Deep-water lines to be deployed on the island slope are being studied.
Drift nets: Several boat deploy surface drift nets even though they are banned by European Union (EU) regulations.[43]
Hand lines: No information available.
Longlines: Martinique's fishermen use a variety of longlines, including bottom set longlines and drifting longlines.[44]
Traps: Traps are the primary gear deployed on the island shelf in water up to 80 meters. Traps made out of wood, palm fronds, or chicken wire to catch fish and shellfish. The failure of fishermen to comply with minimum mesh sizes (31 mm) is severely impairing the demersal resources targeted.
Trawls: Trawls are being developed.

VII. Catch

Martinique authorities estimate the island's annual catch at between 5,000 t and 6,000 tons.[45] Authorities believe that the catch has been relatively stable. Between 1991 and 1996, Martinique's fisheries catch declined from 6,300 t to 3,300 t with the greatest decrease taking place in the "marine fish" (not specified) category which went from 3,700 t in 1991 to 1,400 t in 1996. A similar decline can be seen for most of the other species harvested by Martinique's fishermen. The catch increased during the period 1997-98 with the 1998 catch reported at 5,500 tons (appendix A).[46]

French scientists estimate Martinique's demersal fishery resource at 4,000 t to 6,000 tons. Pelagic stocks are thought to range between 5,000 t and 7,000 tons.

Fishery stocks found in waters of less than 80 m are generally overexploited because these are most easily accessible to the artisanal fishermen in their small craft.

Fish species that inhabit waters between 80 m and 300 m and pelagic stocks are under exploited because they are in waters to deep -- or too distant -- for local fishing vessels and gear.[47] Because the islands are in tropical waters without upwelling and without much of a continental shelf, production is limited. It is easy to overfish a resource and once overfished, it takes a long time for resources to rebuild.[48] The Martinique catch is composed primarily of pelagic species (normally 55-65 percent).[49]

VIII. Ports

There are about 130 fishing ports located in Martinique.[50] The six most important ports are **Case-Pilote**, **Le François**, **Le Robert**, **Le Marin**, **Le Vauclin**, and **Trinité**. These six ports account for about half of Martinique's total landings of fish and shellfish.[51] Other important ports include Anse d'Arlets, Basse Pointe, Bellefontaine, Carbet, Diamant, Ducos, Fort-de-France, Grand'Rivière, Lamentin, Le Lorrain, Le Prêcheur, Marigot, Riviere Pilote, Riviere Salee, Sainte-Anne, Sainte-Luce, Sainte-Marie, Saint-Pierre, Schoelcher, Trois Ilets. The larger-sized vessels operate out of the port in the capital of Fort-de-France.[52]

Many of Martinique's fishing ports were destroyed by Hurricane David on August 29, 1979. This had a "silver lining" because many had to be replaced, and those that were came equipped with much better facilities for the fishermen. Additional space, unloading facilities, dry docks, repair yards, net repair facilities, etc. all were included in the reconstruction effort.[53]

The Government has initiated a 6-year program beginning in 2000 to improve the fishery infrastructure at four important ports: Casepilote, François, Vauclin, and Trinité. The plan improves buildings, landing sites and market facilities.[54]

IX. Transshipments

There are no known transshipments of swordfish through Martinique.

X. Processing and products

The authors found no information about swordfish being imported nor processed by any company in Martinique. No companies expressed any interest in importing swordfish during a market survey conducted in 1982.

XI. Companies

A National Marine Fisheries Service (NMFS) marketing specialist in the 1980s conducted a survey of the fishing industry of Martinique during the 1980s to determine if fishery products from the United States could be exported to Martinique (appendix c). It is interesting to note that none of the companies surveyed expressed any interest in swordfish. This would suggest little or no market potential for swordfish locally. It is possible that tourism may have resulted in a demand for swordfish in the following decades.

The authors have little additional information on companies currently active in the fishing industry on Martinique:

Poisson Polote: This company is known to have imported fish during the 1990s.

Martiniques's fishermen are organized into cooperatives. The individual cooperatives belong to La Cooperative Maritime d'Avitaillement de la Martinique (COOPEMAR). The cooperatives help the fishermen obtain fuel and supplies at low prices, market their catch, and represent the interests of the fishermen in Government decisions.[55]

XII. Markets

A. Domestic

Like many Caribbean islands, the people of Martinique enjoy seafood. Fish is marketed in a traditional manner. The catch is sold at the landing point, along the side of roads, or in small local markets.[56] Most of the available product consumed is fresh, but dried, salted, or frozen products that are also imported. In 1983, the Martiniquais were consuming an average of 23 kg of fresh fish apiece. Of this amount, 5 kg were imported from Venezuela, Saint Vincent, or Saint Lucia; 8 kg were imported from Mainland France or from Scandinavia (mostly salted, dried, or smoked), 3 kg consisted of locally caught fish, and 1 kg. was locally produced shrimp or spiny lobsters or queen conch.[57]

Fish are generally sold at the beach where they are landed. Some merchants buy a part of the catch. The absence of ice or refrigeration requires the fish to be sold, transported, resold, and prepared quickly. Local seafood prices tend to be somewhat expensive because of the cost of imported fuel, outboard motors, and competition from less expensive imported fish.[58]

Consumption by fishermen and their families accounts for about 25-percent of the total catch. The remaining 75-percent of the catch is sold on the local market. This however, does not meet the requirements of the population and so imports are needed to make up the difference.[59] Average per capita consumption of seafood in Martinique has increased in recent years. Authorities estimate domestic consumption at 16,000 t a year, of which 4,000 t is dried salted or smocked (imported cod or herring).[60]

The strong demand for seafood products draws fishermen from Venezuela and neighboring Caribbean islands. Seafood prices on Martinique are higher than in most other Caribbean countries and Metropolitan France as well. Many foreign fishermen thus land their catch directly at the country's main fishing port at Fort de France. Martinique authorities believe about 1,600 t of fresh fish is delivered in this manner.[61]

B. Trade

Between 1961 and 1988, the catch of fish and shellfish in Martinique ranged between 3,000 t and 5,000 tons. Imports during that same period ranged from 6,700 t in 1961 to a high of 11,900 t in 1988. Exports by contrast were negligible between 1961 and 1976. In 1977, exports were 33 t and these exports reached 162 t by 1988. Eighteen years later, in 1996, Martinique imported 4,500 t of fishery products worth $28 million and exported 34 t of seafood products worth $0.2 million.[62] It is noteworthy that Martinique's landings of fish and shellfish had declined to just under 3,300 t by 1996.

1. Imports

Martinique must rely on imported fish and shellfish to meet the strong demand for seafood. In 1983, for example, local production amounted to 5,100 tons. Consumption by fishermen removed 1,600 t from this amount, leaving 3,500 t available for the general public. Imports of 1,900 t of fresh, refrigerated, or frozen fish amounted to 1,900 while salted, dried or smoked fish imports were 2,200 tons. Imports, thus, were 4,200 t out of 7,700 t available for sale to the general public (this excludes the 1,600 t consumed by fishermen and their families). Thus, slightly less than half of Martinique's total supply of seafood was based on imports in 1983. This was part of a similar trend for the years 1975-1982 when roughly the same amounts were imported.[63]

Photo 3.--Fishermen are selling their dorado catch directly to consumers at the François market stalls. Ice is not commonly use to preserve the fish. IFREMER

In 1996, Martinique imported 794 tons of fresh, chilled or frozen fish worth $6.7 million. Dried, salted or smoked fish amounted to 2,077 t worth about $10.8 million. Canned fish imports were over 733 t worth slightly less than $2.4 million. Imports of fresh or frozen crustaceans and mollusks were 831 t worth $7.7 million), canned crustaceans were 73 t worth about $0.5 million. Small quantities of fishmeal (116 t worth $0.1 million) were also imported for a total of 4,624 tons worth $28.3 million.[64]

Martinique's fishermen are able to meet only a fraction of the total demand. In 1981, two fishing unions, branches of the General Confederation of Martiniquan Workers, asked the government to impose import taxes and quotas on imported fish. The unions claimed that local fishermen were poorly paid for their catches and inexpensive imports were making their lives harder.[65]

2. Exports

In 1996, Martinique exported 34 t of fish (15 t) and shellfish (19 t) worth $192,000. There are few known Martinique swordfish exports, although EU import statistics show imports of 1 t of swordfish from Martinique in 1995 (appendix D1 and D2). United States import statistics show imports of 9.1 t of swordfish from "French West Indies" (a U.S. Customs listing that combines both Guadeloupe and Martinique, appendix D3b).[66]

XIII. Government Policy

The Martinique agency responsible for fisheries is the Direction Departementale des Affairs Maritimes de la Martinique, which is part of the Secretariat d'Etat a la Mer, Prefecture de la Martinique of the Republic of France. The basis for fisheries policy comes from French authorities in Paris, France. Martinique is a part of the French Republic and thus local authorities follow instructions received from Paris.

A. Fisheries law

Martinique is a part of the French Republic and thus local authorities follow laws issued both by the National Assembly in France as well as instructions issue by the European Economic Community (EEC) which has since evolved into the European Union (EU). In the field of international law, EEC or EU regulations take precedence over national legislation.

B. Limits

France claimed a 12-mile Territorial Sea on December 24, 1971. The French claim included Overseas Departments like Martinique. France subsequently declared a 200-mile EEZ on July 16, 1976, which was enacted as Decree of March 6, 1978 for Martinique France signed the Law of the Sea Convention in 1982 with declarations. Marine boundary agreements have been negotiated by the European Economic Community (EEC) and Dominica (July 6, 1993)[67] and Venezuela (January 28, 1983).

Venezuela and France reached an unwritten understanding in 1987 allowing artisanal fishermen from Martinique to fish off Aves Island (Venezuela) in exchange for Venezuelan fishermen being allowed to operate off Martinique (France). This informal agreement is still valid.[68]

C. Management

Fisheries on Martinique is managed in cooperation with the Le Comité Regionale des Pêches. Members of this regional council are elected by the fishermen.[69]

D. Promotion

Martinique officials believe that the best prospects for expanding the fishing lay in the fuller utilization of pelagic resources. One program to better utilize those resources is the deployment of Fish Attraction Devices (FADs). Officials contemplate installing 30 FADs in 6- year program beginning in 2000. The FADs will allow the fishermen to redeploy their fishing effort on pelagics more efficiently. This will allow them to reduce effort on over-exploited in shore demersal resources.[70]

The Martinique Government like officials on several other islands is attempting to convince local fishermen to reduce pressure on inshore grounds and target offshore pelagics. To this end the Regional Council Project was established in 1996. A Taiwan masterfishermen was hired to demonstrate longline fishing aboard a new 9-m vessel. The project includes training opportunities for neighboring Dominican and St. Lucian fishermen.[71]

The Government has sponsored one of the largest FAD programs in the Caribbean. The authors, however, have been unable to obtain much information on the program.

XIV. Research

The large, well-funded French research establishment supports fisheries and oceanographic research on Martinique. IFREMER operates a research facility in Le Robert. IFREMER is France's only exclusively marine research institute on Martinique. IFREMER has a center at Robert with two laboratories. One team works on marine fisheries biology and the technology of fisheries (Laboratoire Ressources Halieutiques). The other laboratory researches aquaculture.[72] Research has included work on pelagics, but mostly focus on coastal pelagics like flying fish.[73] Researchers report some work during 2000 on catching juvenile blackfin tuna and attempting to raise them in cages.[74] There is also some work on large-scale pelagic fishing around FADs. One of the questions being considered is if FADs could be biological traps disturbing spawning and migration patterns.[75] The French marine research operation now known as *the Institut de Rescherche pour le Developpement* (IRD -- formally known as the *Office de la Researcher Scientifique et Technique Outre-Mer*, or ORSTROM) also has a facility at Fort-de-France. The two organization *established* the *Pôle de Recherches Océanologiques et Halieutique Caraïbes* in cooperation with the Antilles-Guyane University. This group has published many scientific documents concerning the fisheries of Martinique.[76] Venezuelan researchers at the Universidad de Oriente and Estación de Investigaciones Marinas de Margarita are also active in the Lesser Antilles because many of the islands share marine boundaries with Venezuela, even some of he northern islands because of Venezuela's possession of Aves Island to the west of Dominica.[77]

Billfish are taken in the Martinique artisanal fishery and French officials have been sampling artisanal landings and did conduct at-sea experimental fishing during a two-year period which helped confirm the existence of mostly immature, male swordfish in the region.

XV. Bycatch

Martinique has only a minimal swordfish fishery and little information is available about the bycatch. Some idea of potential Caribbean longline bycatch are available by assessing the data reported by the U.S. longline fleet in its Caribbean operations (Puerto Rico, appendices G1a-b). While this data does not pertain specifically to Martinique waters or fishing strategies used by Martinique's fishermen, it does provide potentially useful benchmark data.[78] One report indicated that the artisanal or small scale commercial fishermen currently active report a very substantial bycatch of billfish--primarily white marlin.[79] Martinique fishermen have caught turtles in the past including turtles from Venezuela's Aves Island to the west of the island. Currently there is a moratorium on taking turtles. Nine species of seabirds are believed to nest on Martinique and associated cays (appendix E).[80] The authors could not find any information on fishery interactions with seabirds.

XVI. International

A. International relations

As part of France, Martinique's primary fishery relationship is with France--although not an international relationship. Martinique has a variety of access problems--primarily Martinique fishermen wanting access to the waters of neighboring islands. Martinique relations, in part because of the French language and continuing association with France, are not as close with the neighboring islands as is common in the Caribbean.

1. Multilateral

Martinique is not active in multilateral organizations affecting the fishing industry.

OECS: Martinique does not participate in some regional bodices such as the Organization of Eastern Caribbean States (OECS). This is in part a cultural influence. The OECS and many regional organizations are largely dominated by the English-speaking islands.

ICCAT: Martinique is an overseas department of Metropolitan France and, as such, is bound by French commitments to international organizations like

International Commission for the Conservation of Atlantic Tunas (ICCAT).[81] French fishermen, including Marinique fishermen, are obliged to respect the management rules and regimes established to protect tuna, swordfish, marlins, and other billfish in the Atlantic Ocean. In practical terms, this means very little to Martinique since swordfish is rarely taken by local fishermen (appendix B). France rarely raises issues concerning its overseas departments at ICCAT sessions, but has obtained a 4 t bluefin quota for St. Piérre et Miquelon, two small islands off Canada. IFREMER scientists are aware of the international effort to manage or restore North Atlantic swordfish stocks under ICCAT programs and if swordfish is ever considered for development in Martinique, these IFREMER scientists will recommend that it be strictly limited to the small-scale artisanal fleet.[82]

2. Bilateral

Some distant-water fishermen have been active in the eastern Caribbean, including waters around Martinique. An assessment of this is complicated by the fact that Martinique's EEZ is located in two ICCAT 5° squares. The assessment of foreign activity in 1560 is in the Anguilla chapter and 1060 is discussed in the St. Lucia chapter.[83]

France: Although Martinique is completely French, swordfish fishing companies from Mainland France have made little effort to fish for swordfish in the Atlantic Ocean from bases in Martinique. In 1995, the French fishery newspaper, *Le Marin*, reported that the company L'Armement Viking, dispatched its catamaran, the *Viking Marlin*, to fish for swordfish from an unnamed port in the Antilles. In 1996, *Le Marin* reported that L'Armement Viking sent a second catamaran, the *Viking Etretat*, to the Caribbean. That vessel was assigned to fish from a base in St. Martin, Guadeloupe. However, it appears that the information supplied by *Le Marin* was not correct. According to French industry sources, both of l'Armement Viking's ships were sent to La Réunion in the Indian Ocean and possibly to Tahiti in the Pacific Ocean.[84] French fishing sources familiar with L'Armement Viking, however, report that the vessels never were sent to the Caribbean.[85] There are no known mainland French operations in Martinique.[86] The authors found this interesting given the fact that the French fish extensively in much more distant locations in the Indian (La Réunion) and Pacific Oceans (French Caledonia).[87] French sources report that the small size of the Martinique EEZ, restricted by the EEZs of neighboring islands, is one factor. In addition, Marc Taquet, a French fishery scientist based in Martinique reports that French fishery managers do not want to encourage fishing for swordfish in the Atlantic. Already high catch levels and ICCAT limits on Atlantic fisheries are noted along with the desire to limit swordfish fishing to an occasional catch by artisanal fishermen.[88] The French can not exceed the very restrictive ICCAT north Atlantic catch allocation. Thus if fishermen were allowed to fish from Martinique, fishermen from mainland France would have to reduce their catch. France could ask for a separate Antillian quota as they have done for bluefin. It would, however, be a major undertaking at the ICCAT annual meeting to succeed with this. The lack of infrastructure and high cost of imported fuel, spare parts, etc. makes Martinique less attractive to mainland French fishermen.

Cuba: There is no Cuban fishing immediately around Martinique, but there has been Cuban activity immediately to the east of Martinique (Caribbean Overview, appendix D3).

Dominica: The European Union representing France and signed a reciprocal fishing agreement in 1993 for artisanal fishermen. The agreement renewed an agreement previously signed in 1987. The agreement involved reciprocal rights for both Guadeloupe and Martinique fishermen. The EU agreed to ECU 1.65 in financial compensation and to support a fisheries science program on Dominica. Dominica agreed to issue fishing permits for 200 fishing vessels from Guadeloupe and Martinique for various time frames, primarily for demersal species. The EU agreed to issue 20 licenses to Dominican fishermen.[89] Some fishery conflicts are reported between Dominican and Martinique fishermen. Martinique officials attempt to cooperate with the Dominicans. Dominican fishermen, for example, are included in the Regional Council Project which is training local fishermen for longline operations.[90]

Japan: Japanese fishermen were active in the waters around Martinique and neighboring islands during the 1960s and 70s. They have not, however, operated in the ICCAT squares (1060 and 1560) since 1974-75. Operations targeting tuna were usually conducted in the second and third quarters. The annual swordfish by catch was small, but especially in 1560 exceeded 1 ton. The Japanese in 1060 during one quarter (third quarter of 1966) reported a catch of 11.8 tons (Anguilla appendix D and St. Lucia appendix E).[91]

St. Lucia: Some fishery conflicts are reported between St. Lucian and Martinique fishermen. Martinique officials attempt to cooperate with the St. Lucians. St. Lucian fishermen, for example, are included in the Regional Council Project which is training local fishermen for longline operations as part of the St. Lucia Tuna and Longline Training Project.[92]

Spain: Spain operates one of the largest Atlantic longline fisheries. The Spanish fishermen, however, do not fish as far west as the Caribbean.[93]

Taiwan: Taiwan fishing around Martinique and neighboring islands began in 1968. Taiwan fishermen have been particularly active in ICCAT square 1560, perhaps related to the transhipping activity.[94] Activity was somewhat varied in 1060, but in 1560 primarily conducted in the second and to a lesser extent the third quarter. Taiwan fishermen were not active around Martinique after 1987, but resumed fishing there in 1996 (Anguilla appendix D and St. Lucia appendix E). As much as 7.5 t of swordfish have been taken in a single quarter (fourth quarter, 1996).

United States: U.S.-flag swordfish longliners have operated in the Caribbean Sea to the east of Martinique during the 1990s. More significant effort, however, takes place well to east and north the islands in the Atlantic Ocean.[95] There are no reports available to the author that suggest that U.S. vessels are landing their catch in Martinique nor using any ports in Martinique.

Venezuela: Martinique's fishing community has sometimes worked with Venezuelan fishermen and several vessels operated with mixed French-Venezuelan crews in Venezuelan waters. At the same time, there are sometimes concern expressed by local fishermen over inexpensive imports of fish and shellfish from Venezuela. At one point unconfirmed reports suggested that some Venezuelan fishermen were landing some of their catch in Martinique. The species involved reportedly included high-value billfish (primarily sailfish, marlin, and tuna). It is thought that these landings took place when a temporary Venezuelan government resolution banned billfish fishing along much of the eastern coast of Venezuela. This situation caused several artisanal longline fishermen who fished off Margarita Island to land their catch illegally at night in Martinique. Artisanal swordfish fishermen were also affected.[96]

B. Joint ventures

There are no reports of any joint venture fishing operations for swordfish. There are, however, joint venture operations involving four Martinique-flag vessels operating with mixed French and Venezuelan crews that operate in Venezuelan waters for part of the year.

XVII. Enforcement

Enforcement of fishing regulations is the responsibility of French Coast Guard and the French Navy. In 1993, the French Coast Guard vessel *Francis Garnier* reportedly fired at a Dominican fishermen. The incident reportedly took place in Dominican waters south of the island of Scotshead. There were suggestions that other Dominican fishermen may have been fired upon by the French Coast Guard in the past. No further details were reported to confirm or deny this report.[97]

XVIII. Future Trends

It does not appear likely that Martinique's fishing community will be able to develop a significant fishery for swordfish in the next few years. Lack of experience, infrastructure, vessels and ICCAT management programs makes it unlikely that a modern commercial fishery will occur. If a fishery were established, it would likely be the result of a recreational fishery. This has not yet happened and there is nothing in the literature to suggest that it will in the near future.

Fishery officials believe that despite the stagnant catches, marine fisheries have a future on Martinique if the proper management policies are implemented and enforced. Officials believe that the current part-time and occasional fishermen need to be more fully integrated into the professional cadre and better trained. Much work needs to be done to improve methods and comply with existing regulations designed to limit fishing effort. Port facilities to preserve and market the catch also need to be improved. The fleet also needs to be modernized. There is no sign, however, that this means introducing pelagic longliners although longline gear is being used. Effort needs to be redeployed to concentrate more in pelagic resources. Conditions for the fishermen, especially safety provisions, need to be improved. The fishermen should be better informed about the need to comply with measures designed to conserve the resource to achieve optimal utilization.[98]

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Endnotes

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2. Direction Régionale des Affaires Maritimes, Guadeloupe-Martinique-Guyane, Préfectures de la Guadeloupe, de la Guyane, de la Martinique, Secrétariat d'État Auprès du Ministre de l'Urbanisme, du Logement et des Transports Chargé de la Mer letter dated April 17, 1986 and J.C. Clement, *Le Marche des Produits de la Mer en Martinique*, Service de Développement et d'Aide Technique, Marine Marchande, Affair Maritimes, Quartier de la Martinique, August 1980, p.13.
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4. J.C. Clement, *op. cit.*, p.8.
5. J. Le Bail, *Quel Avenir Pour la Pêche Francaise dans les Caraibes?,* Université de Bretagne Occidental Laboratoire URA 904, "Dynamique et gestion des espaces littoraux," B.P. 814, 29285 - Brest, France, 1994, p. 202.
6. Bouqueau, *op. cit.*, April 3, 2000.
7. J. Le Bail, *op. cit.*, p. 202.

SECTION II. (Species)

8. Called dolphinfish by the local fisherman.
9. Hawksbill, green, loggerhead, and leathery turtles are found in Martinique's waters. They were caught as late as 1992, using nets that are about 100 fathoms long by 4 to 5 fathoms deep. The nets are set at night in passages between reefs. A. Guillou and A. Lagin, "Engins et Techniques de Peche de la Martinique," Station IFREMER, Point Fort, 97231 Le Robert, Martinique (RI-DRV/RH/RST/97-10).
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11. Alain Guillou and Lagin Alain, *op. cit.* Table 2 identifies *Xiphias gladius LINNAEUS* as one of the "main large pelagic fishes targeted by fishermen in Martinique." Figures 4-6 illustrate that drifting longlines are used to harvest swordfish.
12. L. Reynal, Delegue IFREMER/Antilles in a letter to Guillermo E. Laya, dated March 15, 2000.

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19. Michel Desse, "Vers une nouvelle géographie des pêches martiniquaises, *La Pêche Maritime*, May 1988, p. 330. The number of canoes reported by Mr. Desse is lower than reported in a letter dated 17 April 1986, from the Direction Régionale des Affaires Maritimes, Guadeloupe-Martinique-Guyane, Préfectures de la Guadeloupe, de la Guyane, de la Martinique, Secrétariat d'État Auprès du Ministre de l'Urbanisme, du Logement et des Transports Chargé de la Mer.
20. Bouqueau, *op. cit.*, April 3, 2000.
21. *Ibid.*

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22. Hon Juey Pso, masterfisherman, Martinique Regional Council Project, personal communications, February 22, 2000.
23. Hillory LaForce, Fisheries Loan Officer, Saint Lucia Development Bank, personal communications, March 2, 2000.
24. Lambert Citalis, President, Goodwill Fishermen's Cooperative (St. Lucia), personal communications, February 28, 2000 and LaForce, *op. cit.*, March 3, 2000.
25. Jimmy Lee Lum, General Manager, Trinidad Steam Laundry, personal communications, April 11, 2000.
26. *Monographie des Peches Maritimes en Martinique*, Annee 1980, Quartier de la Martinique, Marine Marchande, Affaires Maritimes, Groups Antilles-Guyane, May 1981.
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29. J. Marcille, "Tuna resources of the Lesser Antilles: Present state of fishing and prospects for development," *FAO Circular*, No. 787 (FIRM/C787) (FAO: Rome, August 1985), p. 8.
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32. MacLeish, *op. cit.* pp. 126-27, 130 and 140.
33. Direction Régionale des Affaires Maritimes, *op. cit.*
34. Clement, *op. cit.*, p.17.
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39. Direction Régionale des Affaires Maritimes, *op. cit.*
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42. L. Reynal and B. Gobert, "La gestion des ressources marine en Martinique," *Equinox,* December 1, 1989, pp. 14-20.
43. Bouqueau, *op. cit.*, April 3, 2000.
44. Guillou, Alain and Alain Lagin, *op. cit.*

SECTION VII. (Catch)

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46. Food and Agriculture Organization of the United Nations, *FAO Yearbook, Fishery statistics - Capture production, 1998,* Volume 86/1, Rome, 2000, p. 605.
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SECTION VIII. (Ports)

50. Reynal, L., *op. cit.*
51. Desse, Michel, *op. cit.*, p. 330 and J.C. Clement, *op. cit.*
52. Clement, J.C., *op. cit.* p. 3.
53. Desse, *op. cit.*, p. 330.
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SECTION XI. (Companies)

55. *Ibid*

SECTION XII. (Markets)

56. *Ibid*
57. Abbès, *op. cit.*
58. *Ibid*
59. At least this was the situation between 1977 and 1983, when total landings averaged between 4,500 t and 5,500 t. Fishermen consumed between 1,200 t and 1,600 t during this time period, leaving an average of between 3,200 t and 3,900 t. File letter dated 17 April 1986, from the Direction Régionale des Affaires Maritimes, Guadeloupe-Martinique-Guyane, Préfectures de la Guadeloupe, de la Guyane, de la Martinique, Secrétariat d'État Auprès du Ministre de l'Urbanisme, du Logement et des Transports Chargé de la Mer.
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SECTION XIV. (Research)

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73. A good regional overview of the flying fish fishery is available in Organization of Eastern Caribbean States, "The Eastern Caribbean Flyingfish project," *OECS Fishery Report*, No. 9, 1993, p. 171.
74. Mathieu Doray, IFREMER, posting on FISHFOLK, November 30, 2000.
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77. For details on Venezuelan research institutes see the Venezuelan chapter of this report.

SECTION XV (Bycatch)

78. See the chapter on Puerto Rico for more details.
79. Rolf Juhl, NMFS memo, March 25, 1988.
80. Ruud van Halewyn and Robert L. Norton, "The status and conservation of seabirds in the Caribbean," in J.P. Croxall, P.G.H. Evans, and R.W. Schreiber (eds.), "Status and conservation of the world's seabirds," *ICBP Technical Publication*, No. 2 (ICBP: Cambridge, 1984), pp. 175-176.

81. It was agreed at the 1997 ICCAT annual meeting that all EU-member states would withdraw from ICCAT effective December 31, 1997. France and the United Kingdom then rejoined ICCAT in respect of their dependent or overseas territories.

SECTION XVI. (International)

82. Taquet, Mark, Alain Guillou, Lionel Reynal, Alain Lagin, *op. cit.*, p. 6.
83. ICCAT publishes catch data by 5° squares. In the northwest Atlantic they are numbered by the intersecting longitude and latitude at the southeast corner of the 5° square. ICCAT swordfish catch data based on these 5° squares is available in the series D appendices of the Caribbean Overview.
84. Thierry Bersihand, Marinex Ltd. personal communication with Dennis Weidner on May 25, 1999. Mr. Bersihand used to work for the company. He reported that l'Armement Viking's fishery in the Caribbean was shifted to the Indian Ocean.
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86. *Ibid.*
87. See for example François Poisson, Emmanuel Tessier, David Roos, François Conand, and François René, "Recent essor des pêcheries d'espadon (*Xiphias gladius*) aux abords de la Reunion (Océan Indien S.O.)," undated IFREMER/ORSTOM manuscript, probably published in 1995. Copy provided the authors by IFREMER Librarian Michelle l'Excellent, May 22, 2000.
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90. Pso, *op. cit.*, February 22, 2000.
91. Data by ICCAT square and country for the surrounding area is available in the Caribbean Overview series D appendices or directly from the ICCAT website: ICCAT: http://www.iccat/es/Stats.html
92. *Ibid*
93. See for example ICCAT, "1994 SWO background document: Figures," *op. cit.*, p. 91.
94. See the St. Maartens chapter of this report for details.
95. Jean Cramer and Heather Adams, *Large Pelagic Logbook Newsletter - 1996*, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Science Center, 75 Virginia Beach Drive, Miami, Florida 33149, January 1998, p.3.
96. Weidner, *op. cit.*, p. 41.

SECTION XVII. (Enforcement)

97. "French Coast Guard Reportedly Fires on Fishermen," Bridgetown CANA in English, 1641 GMT, March 20, 1993.

SECTION XVIII. (Future Trends)

98. Bouqueau, *op. cit.*, April 3, 2000.

Appendix A.--Martinique. Fisheries catch, 1980-98

Year	Catch
	Metric tons
1980	4,891F
1981	4,700F
1982	5,500F
1983	5,107F
1984	5,174F
1985	4,604F
1986	5,000F
1987	3,123
1988	3,000
1989	3,239
1990	3,498
1991	6,294
1992	4,538
1993	5,843
1994	5,788
1995	5,300
1996	3,266
1997	5,000
1998	5,500

F - FAO estimate
Source: FAO, *Yearbook of Fishery Statistics*, (FAO: Rome, various years).

Appendix B.--Martinique. Swordfish longline catch, 1960-89

Year	Catch
	Metric tons
1970	-
1971	-
1972	-
1973	-
1974	-
1975	-
1976	-
1977	-
1978	-
1979	-
1980	-
1981	-
1982	-
1983	-
1984	-
1985	-
1986	-
1987	-
1988	-
1989	-

Source: ICCAT, "Report of the Standing Committee on research and Statistics," *ICCAT Report*, Part I, 1990-91 (ICCAT: Madrid, Spain, 1991), p. 233.

Appendix C.--Martinique. List of seafood companies, 1982.

A marketing survey of Martinique conducted by William O. Antozzi, Jr., Fishery Marketing Specialist, in *An Assessment of Seafood Markets in Guadeloupe and Martinique* of the National Marine Fisheries Service in 1982 generated the names of several seafood companies and the species they dealt with. Current information is not available. These companies and the fish species or activities they were interested in were:

Pecheries Antillaises
6, Rue Lamartinie
97200 Fort-de-France
Martinique
Blue runner, jack crevalle, shark, mullet, bluefish, king mackerel, scad, and tuna.

Ets Cottrell
Zone Industrielle La Lezarde
97232 Lamentin
Fort-de-France
Martinique
Blackfin tuna, blue runner, jack crevalle, red porgy.

SOFRIMA-Multi Cahs
Zone Industrielle La Lezarde
97232 Lamentin
Fort-de-France
Martinique
Blue runner, scad, king mackerel, crayfish, pink porgy, shark.

Ets. G. Fabre
Cite Artisanale
97200 Fort-de-France
Martinique
Jack crevalle, blue runner, snapper, red porgy, squid, scad, crayfish.

Monoprix-SADECO
Dillon
97200 Fort-de-France
Martinique
Jack crevalle, blue runner, red porgy, mullet.

Ets Robert Vilo
Zone Industrielle La Lezarde
97232 Lamentin
Fort-de-France
Martinique
Jack crevalle, blue runner, red porgy, tuna, crayfish

Jean-Yves Barthe
Petit Morne
97232 Lamentin
Fort-de-France
Martinique
Joint venture fishing for finfish.

Caraibe Maree
Boulevard Chevalier Sainte-Barthe
97200 Fort-de-France
Martinique
Joint venture fishing for spiny lobster.

Comptoir Commercial Caraibes
Zone Industrielle de Jarry
97122 Baie-Mahault
Guadeloupe
Red porgy, grouper, crayfish, scad.

SOFROI
Morne l'Epingle
97110 Pointe a Pitre
Guadeloupe
Red porgy, squid, scad.

Source: William O. Antozzi, Jr., Fishery Marketing Specialist, "An Assessment of Seafood Markets in Guadeloupe and Martinique, April, 1982," National Marine Fisheries Service, Duval Building, 9450 Koger Boulevard, St. Petersburg, FL 33702, May 7, 1982.

Appendix D1.--Martinique. Swordfish exports by destination, 1991-99

Destination	Year										
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	Metric tons										
United States	-	-	-	-	-	-	-	-	-	-	-
Japan	-	-	-	-	-	-	-	-	-	-	NA
European Union	NA	-	-	-	-	1	-	-	-	-*	NA
Others**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total	NA	-	-	-	-	1	-	-	-	-	NA

* Through November
** Swordfish shipments to other countries are believed to be non-existent or negligible
Source: Various

Appendix D2.--European Union. Swordfish imports from Martinique, 1991-95

Country	Commodity	Year								
		1991	1992	1993	1994	1995	1996	1997	1998	1999
		Metric tons								
France	Fresh	-	-	-	-	1	-	-	-	-*
Total		-	-	-	-	1	-	-	-	-*

* Through November
Source: EU. Eurostat data.

Appendix D3a1.--United States. Swordfish imports from the French West Indies*, 1975-2000

Year	Commodity		Total**
	Fresh	Frozen	
	Metric tons		
1975	-	-	-
1976	-	-	-
1977	-	-	-
1978	-	-	-
1979	-	-	-
1980	-	-	-
1981			9.1
1982	-	-	-
1983	-	-	-
1984	-	-	-
1985	-	-	-
1986	-	-	-
1987	-	-	-
1988**	-	-	-

* Term used in U.S. Customs statistics, combining Guadeloupe and Martinique
** Beginning in 1989, imports from Guadeloupe and Martinique were listed seaparately under each island.
Source: U.S. Bureau of the Census

Appendix D3a2.--United States. Swordfish imports from Martinique, 1989-2000

Year	Commodity		Total
	Fresh	Frozen	
	Metric tons		
1989	-	-	-
1990	-	-	-
1991	-	-	-
1992	-	-	-
1993	-	-	-
1994	-	-	-
1995	-	-	-
1996	-	-	-
1997	-	-	-
1998	-	-	-
1999	-	-	-
2000	-	-	-

Source: U.S. Bureau of the Census

Appendix D3b1.--United States. Swordfish imports from the French West Indies*, 1975-88

Year	Commodity		Total
	Fresh	Frozen	
	US$1,000		
1975	-	-	-
1976	-	-	-
1977	-	-	-
1978	-	-	-
1979	-	-	-
1980	-	-	-
1981			28
1982	-	-	-
1983	-	-	-
1984	-	-	-
1985	-	-	-
1986	-	-	-
1987	-	-	-
1988**	-	-	-

* Term used in U.S. Customs statistics, combining Guadeloupe and Martinique
** Beginning in 1989, imports from Guadeloupe and Martinique were listed seaparately under each island.
Source: U.S. Bureau of the Census

Appendix D3b2.--United States. Swordfish imports from Martinique, 1989-2000

Year	Commodity		Total
	Fresh	Frozen	
	US$1,000		
1989	-	-	-
1990	-	-	-
1991	-	-	-
1992	-	-	-
1993	-	-	-
1994	-	-	-
1995	-	-	-
1996	-	-	-
1997	-	-	-
1998	-	-	-
1999***	-	-	-

* Term used in U.S. Customs statistics, combining Guadeloupe and Martinique
** Totals may not agree due to rounding
*** Through February
Source: U.S. Bureau of the Census

Appendix E.--Martinique.# Seabird nesting, 1984

Area	Information	Species*	Known** threats	Importance***
Martinque	Reasonable	3, 5, 6, 10, 12, 16, 18, 19, 22	Ex?, Ha?, ?	Important

Venezuelan jurisdiction. The authors only recebtly found this source and were unable to include it in the Venezuelan chapter. We are including it here as Aves is close to Dominica.
* Species: 3 - Puffinus I. lherminieri; 5 - Phaethon aethereus; 6 - P. lepturus; 10 - S. leucogaster; 12 - Larus atricilla; 16 - S. dougallii; 18 - S. anaethetus; 19 - S. fuscata; 22 - A. stolidus
** Threats: Ex - exploitation of eggs, young or adults; Pr - predators, generally introduced mammals; Ha - habitat destruction or disturbances; Po - pollution; Fi - fisheries
*** A rough subjective rating of relative importance of area for breeding seabirds.
Source: Ruud van Halewyn and Robert L. Norton, "The status and conservation of seabirds in the Caribbean," in J.P. Croxall, P.G.H. Evans, and R.W. Schreiber (eds.), "Status and conservation of the world's seabirds," *ICBP Technical Publication*, No. 2 (ICBP: Cambridge, 1984), pp. 175-176.

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